Anticyclone Systems

AntiLog
RS232 Data Logging System
User Guide

DOC/ANTILOG/UG/2003001/5.1

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Disposal of your old product

AntiLog hardware is constructed from high quality materials and components, which can be recycled and reused. This product is covered by the European Directive 2002/96/EC. Please inform yourself about the local separate collection system for electrical and electronic products. Please act according to your local rules and do not dispose of your AntiLog product with your normal household waste.

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1. Introduction

The AntiLog range of products from Anticyclone Systems Ltd provide a very effective way to log RS232 data from a vast range of civil and military products including GPS navigation receivers, laboratory and medical equipment, process control systems and sensor units (e.g. temperature, weight, inertial). There are boxed versions of the product which can operate stand alone and there are OEM versions which allow you to easily add a data logging solution to your own equipment configurations. All versions of the product can be fed with an external DC power source for extended operation.

The design goal was to establish an incredibly simple to operate RS232 data logging system that only required two panel mounted buttons - 'On' and 'Off'. Even though AntiLog units are simple to operate, there are no compromises on features available or on performance. Each AntiLog unit contains an embedded microcontroller which is able to perform full speed real time capture of RS232 data without any hold off (e.g. flow control) which could upset the timing of equipment under investigation.

V5.1 of the embedded software supports both the original AntiLog hardware and the new AntiLogPro hardware design. V5.1 is backward compatible with all previous AntiLog board revisions and has the ability to log two independent serial port data streams at the same time on supported hardware. This is a very powerful feature which can be likened to having two single channel AntiLog units in one box. As an example, with dual serial port logging, you are able to monitor RS232 data in both directions on an existing full duplex RS232 link, even if the two data paths have different baud rates and port settings.

The key to the success of AntiLog lies in the ability to configure the system before trials or other recording sessions take place. AntiLog units are configured for operation using an interactive menu system. The menu system built into the product is operated by a standard RS232 terminal application connected to the AntiLog serial port. All user configurations and any recorded data are stored in non-volatile memory so flat batteries or battery changes have no effect on the unit's configuration or the recorded data.

The default user configuration shipped with AntiLog will almost certainly need changing to suit your recording and playback needs. To simplify unit configuration, you are able to group together and store up to four named sets of user options so that you can later recall these in one go for your different data logging trials.

1.1 Example Application

As an example, you could use AntiLog to test GPS navigation application software on a PC in a repeatable way. To do this, you would collect real GPS data using AntiLog and play it back into your PC application as many times as you want in real time to simulate the GPS receiver.

Use the AntiLog terminal menu system to configure real time playback and to set the record and playback baud rates to be the same as the GPS receiver. Then connect AntiLog to the GPS receiver and record the NMEA output for a representative period of time. Simply switch AntiLog off using the 'Off' button to terminate the logging session. Next, you would connect the AntiLog unit to the PC using a NULL modem cable and press and hold the 'On' button so

that the unit powers up in playback mode. Stop and start the playback of the recorded data into your PC application using 'On' and 'Off' button presses or even restart playback from the beginning of the log data at any time just by pressing the 'On' button.

Note that in this example, once the terminal menu system has been used to configure AntiLog, no further contact with a host machine is required. Simply use the unit with the 'On' and 'Off' buttons to conduct data logging and playback.

2. Important Information

2.1 User Guide Applicability

This manual refers to AntiLog products from Anticyclone Systems Ltd running release V5.1 of the embedded software. All original AntiLog hardware release revisions are supported up to and including REV F. AntiLogPro hardware is supported at REV A.

The embedded software release version number and hardware revision codes can be determined from the playback terminal menu system described in section 10 of this document. Separate supplement guides are available for the OEM versions of the product and for the additional option packs which extend AntiLog capability for specific users. For more details, see section 17.

AntiLog V5.1 embedded software is therefore available for all existing AntiLog hardware revisions. Note that some of the earlier AntiLog hardware may not be able to support some of the latest features (for example, not all older hardware supports the dual serial port feature).

2.2 Intended Use

AntiLog is intended exclusively for use as a low voltage RS232 data recording and playback system. Anticyclone Systems Ltd is not liable for any damage resulting from improper use.

2.3 Safety

- Avoid exposure to extreme humidity (e.g. do not spray or submerge in water).
- Never apply more than 18.0V to the DC supply input to avoid damage and always ensure mains power adapters are safe, correctly insulated and correctly earthed before use.
- Ensure the equipment to be connected to your AntiLog unit is correctly earthed and does not apply power in any form to the RS232 signal connections.
- Do not expose the AntiLog enclosure to any solvents.
- Do not store or operate this product within the reach of children – this product is not a toy!

2.4 Maintenance

Clean boxed AntiLog units with a dry cotton cloth which should be slightly moistened in case of heavy staining. Never use cleaning agents which contain solvents.

2.5 Recording Considerations

Always select the correct RS232 baud rate and the correct number of RS232 data bits for data recording. Any data collected using AntiLog where there is a difference between the recording baud rates and/or the number of data bits per character may result in severely corrupted or lost data. In common with any other RS232 data recording system, it is not

normally possible to recover any information from data recorded at the wrong baud rate or data recorded with the wrong number of RS232 data bits per character.

2.6 Playback Considerations

The playback baud rates are completely independent of the baud rates you used to record the data. You may select any combination of baud rate and RS232 bits per character which suit your needs. However, If you attempt to use a terminal program to view the AntiLog playback menu system you may see nothing if the terminal baud rate and/or data bit selection is different to the currently set AntiLog menu baud rate. Section 5.2 describes how to reset the menu port settings to a known state if this happens. Additionally, if you have hardware that supports the Dual Serial Port feature, playback and/or the menu system may be assigned to different hardware serial ports and so output may not be seen on the primary port.

Also note that if you choose to playback data with less RS232 bits per data character than the recorded data format, data corruption may occur if any of the output bytes don't fit into the bits specified. The safest policy is to leave the number of RS232 bits per character set to eight for playback and for the menu system unless your host equipment requires other settings.

2.7 Battery Life

If you are running from an internal battery, always use a new one when recording important trials data. To maintain the life of the battery, it is recommended that it is disconnected completely from the system if AntiLog is not to be used for more than a week or so. This is because AntiLog supports active power management which means that there is a very small current drain on the battery when AntiLog is switched off. Over extended periods of time, this standby current will effect the total charge remaining in a given battery. Use the battery check feature at the main playback terminal menu to ensure the battery is in good condition.

If you do not need to transmit to your unit in record mode (e.g. you are not transmitting polling or other equipment initialisation requests) then you can save power by not physically connecting the transmit pin from AntiLog. This power saving tip works because AntiLog must drive the fixed load in the equipment if this connection is made which will consume a small amount of power. Note that AntiLogPro hardware automatically performs this function for you internally without the need to disconnect any signal wires from the connecting cable.

When AntiLog is idle, it will consume less power when running V5.1. Typically, AntiLog can reduce the running power consumption by 25% compared to the original single channel build of AntiLog software. If your data source has data gaps (such as during GPS NMEA sentence transmission) then you will observe lower power consumption compared to full rate data.

For the original AntiLog boxed units fitted with the Real Time Clock (RTC) feature (hardware REV F and above, and RTC upgrades), there is a backup battery fitted to the upper PCB card mounted in the lid section of the unit which may need replacing after several years use. A warning will be displayed via the terminal menu system if an RTC power failure has been detected. Replacing this battery will require screwdriver access to remove the lid assembly. In the AntiLogPro design, there is a rechargeable Lithium battery inserted into a holder on the main PCB so that the battery can be replaced should it fail to hold charge.

2.8 AntiLog Customer Options

The standard hardware and embedded software provide a core level of functionality that is designed to meet the vast majority of customer data logging needs. Section 16 gives a complete list of features that apply to the various hardware revisions. For each AntiLog build type, there are two available variants, boxed and OEM.

For specific customers, extra software and hardware options are available in the form of option packs. Option packs simply extend the capability of the standard AntiLog product. For example, the 'M' option pack provides effective logging of serial data from Military or Government GPS receivers. See section 17 for a summary of the option packs available.

2.9 AntiLog Design Variants

The following table describes the main capability differences between the AntiLog hardware design build variants when running V5.1 of the embedded software.

Capability	*AntiLog*	*AntiLogPro*
Number of hardware serial ports supported	2	3
Maximum supported baud rate (each channel)	460800	921600
Maximum full rate single channel data logging (baud)	230400	921600
Maximum full rate dual channel data logging (baud per channel)	115200	460800
Pins that can be used as logged digital inputs	5	8
Bi-colour LED state indicators	1	2
User invertible RS232 lines (e.g. for CMOS level logging)	N	Y
Selectable “ring buffer” storage method	N	Y
Battery test voltage indicator (maximum)	9.9V	20.0V
One Pulse Per Second (1PPS) output time stamp reference (OEM only)	N	Y

Figure 1: AntiLog

Figure 2: AntiLogPro

3. Quick Start Guide

When you first receive your AntiLog unit, you will want to check that it functions correctly. You may also want to change the settings from the factory defaults. The following very top level description will allow you to connect AntiLog to a PC, power it up for the first time, turn it off, turn it back on in record mode and turn it off again. For more details on all of these actions, see the rest of the user guide.

- Connect a NULL modem 9 way D cable (one is supplied with boxed AntiLog) between the AntiLog unit and a PC.
- Configure a terminal program of your choice (such as Microsoft HyperTerminal) on the PC to 115200 baud, 8 bits, no parity with handshaking set to 'none'.
- Fit a battery to AntiLog or connect a regulated 4.5V to 18V (maximum) to the DC power jack, centre pin +ve.
- Switch on AntiLog in playback mode by holding down the 'On' button until a green LED lights, then release.
- Terminal should now show the main menu (use terminal space bar to refresh the display).

```
AntiLog-MR V5.1, Serial number ASL/16/001, 28-Feb-2011 15:20:03.519

(32430 bytes recorded in 1 session, 0% of 489.2MB)
(PLAYBACK mode.  Data transfer and 'On' button aware)

 <S> Start playback now (or use 'On' button)
 <R> Recording options
 <P> Playback options
 <G> General options
 <L> Lock user options
 <B> Battery check
 <A> About AntiLog
 <U> Shut down
?
```

- Use terminal keyboard input to select menu items and change AntiLog settings.
- To turn AntiLog off, hold the 'Off' button down for more than 1 second. You should see both LED colours flash briefly to confirm power down, then release.
- To turn AntiLog on in record mode, simply press the 'On' button for a short period (i.e. less than 1¾ seconds), LED will flash red. Note that LED will flash red followed by a number of green (and/or yellow) flashes to show you AntiLog is writing data to FLASH store in record mode.
- To turn AntiLog off again, hold 'Off' button down for more than 1 second, wait for LED confirmation, then release.

4. Getting Started

4.1 The 'On' and 'Off' Buttons

There are two push buttons and one (AntiLog hardware) or two (AntiLogPro hardware) bi-coloured, high intensity LEDs mounted on the front panel of the boxed units. The buttons are sensitive to the amount of time they are held down to allow the unit to operate in different ways (e.g. to start the recording and playback modes). The green push button labelled 'On' is used to switch the unit on and the red push button labelled 'Off' is used to switch the unit off.

The buttons can also be used when AntiLog is already powered on to perform other functions. For example, the 'On' button can be used to start the playback of recorded data or log events and send selected user commands to connected equipment in record mode. The 'Off' button can stop data playback and can also be used in the record mode for selected event recording and user command output.

All that is required to get AntiLog working is a power source and an RS232 data cable connection. The main power source can be a PP3 battery fitted internally, or an external source plugged into the external DC power connector.

4.2 Fitting an Internal Battery

To fit a new PP3 battery, remove the battery compartment cover on the back of the AntiLog enclosure by pressing down on the marked area and sliding the cover back.

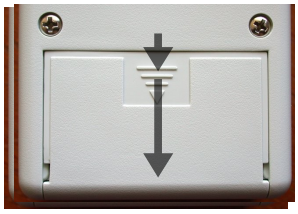


Figure 3: Battery access

Fit the PP3 battery to the PP3 flying lead clip inside observing the polarity of the connector. Note that it is not possible to damage AntiLog by making a connection with the wrong polarity. Refit the battery cover.

4.3 Supplying External Power

External power can be fed into AntiLog units via a DC power jack to extend normal operation. The original AntiLog hardware requires a 6.5mm DC power jack (2.1 mm inner pin size) connection. AntiLogPro hardware requires a 1.3mm DC power jack. All AntiLog units accept regulated DC power in the range 4.5 to 18V (9.5 to 18V for the Forced Power 'P' option) which means for example that AntiLog can be fed directly from a 12V car battery source for vehicle trials. NEVER APPLY MORE THAN 20V ABSOLUTE MAXIMUIM to the DC feed at any time otherwise you may permanently damage your unit.

When supplying external power, the centre pin of the external DC power connector must be positive with respect to the outer barrel to supply power to AntiLog. It is not possible to damage AntiLog by applying power with the wrong polarity. However, if an internal PP3

battery is fitted, the power will be taken from this instead of the external source and hence the system may give the impression of being powered externally, but will stop logging when the internal battery runs out.

AntiLog gets its power from either the internal battery connection or from an external power source. If an internal battery is fitted then the external power source MUST have a higher voltage than the terminal voltage of the battery fitted, otherwise the external DC power source will be ignored and instead, power will be taken from the internal battery. For this reason, it is recommended that the external DC voltage should be 10V to 18V if an internal PP3 is already fitted.

Anticyclone Systems Ltd recommend fitting an internal battery if you are supplying an external power source higher than 9V because if for some reason the external supply of power to the AntiLog unit is interrupted for a short time (e.g. a car adapter gets knocked or vibrated out of position during a car trial) then the internal battery power source will automatically take over and cover for the drop out period.

The external DC power source will never attempt to charge any internally fitted cell. If you do fit a PP3 rechargeable cell into AntiLog, this is OK, but it must be removed from the unit and recharged separately when required.

4.4 Switching On for the First Time.

Connect your AntiLog unit to a PC using a NULL modem cable (the cable is supplied with the boxed version of the product). Configure a terminal port application (such as Microsoft HyperTerminal) to 115200 baud, 8 bits no parity with no flow control.

Press and hold the 'On' button until the green LED lights (top LED for AntiLogPro hardware) to enter the playback mode and release. You have now started AntiLog in the playback mode (LED will flash green) and the text based menu system will appear on the terminal screen.

5. The Menu System

5.1 The Main Playback Menu

The playback main menu will appear each time the unit is powered on in playback mode[1]. The default serial port settings for the playback menu system are 115200 baud, 8 bits, no parity, one stop bit. The menu system allows you to quickly change recording, playback and system settings within AntiLog. All settings are non-volatile which means that they will remain active even if all sources of power are removed.

A display is shown for each menu and single keys are typed into the terminal to select different menu options. Keyboard selections available are enclosed in either angled (<>) or square ([]) brackets. If a menu item is shown in angle brackets, it means that a sub menu or other prompt or action will follow this menu item if selected, else square bracketed items show that an item is selectable directly on the page. A '*' character next to a menu item indicates that item is active or selected. Text within menus which appears in between curly brackets, '{' and '}', indicate a currently active value for a selectable item.

The terminal keyboard 'Escape' key is used to abort operations and to exit sub menus. For some special sub menu functions, the 'On' or 'Off' buttons must be used to confirm or reject user input. The current menu content can generally be refreshed to the terminal by typing the terminal space bar at any time. The following is an example of an AntiLog main menu:-

```
AntiLog-[R] V5.1, Serial number ASL/16/001, 25-Feb-2011 12:09:10.234

(Ch1=602475, Ch2=2113535 bytes recorded in 2 sessions, 1% of 244.7MB)
(PLAYBACK mode.  Data transfer and 'On' button aware)

 <S> Start playback now (or use 'On' button)
 <R> Recording options
 <P> Playback options
 <G> General options
 <L> Lock user options
 <B> Battery check
 <A> About AntiLog
 <U> Shut down
?
```

The first line starts with the product name (e.g. `AntiLog` or `AntiLogPro`). If the name is followed by `_OEM` (e.g. `AntiLogPro_OEM`) then the software is running on OEM hardware and extra features will be enabled later in the menu system to allow access to the extended features in the OEM version of the product.

The product name is followed by a dash and any options you have installed. In the example, `[R]` means the AntiLog hardware real time clock is present. Following on this line is the embedded software version number, a unique product serial number and the current date and time (if available).

The next line shows how many bytes (characters) are currently recorded (both channels when applicable) to the flash media store, how many sessions have been recorded and how full the store currently is (as a percentage) and the total data storage capacity of the installed media in MB (Megabytes) or GB (Gigabytes), whichever is appropriate.

1 Selecting the 'Menu Quiet' item in the 'General' menu will inhibit this output if desired.

The next line shows that AntiLog is in playback mode and it is ready for special AntiLog specific 'Data Transfers' upon request, and it will start transmitting data from the start of the store as soon as the 'On' button is pressed.

The items in the main menu allow you to enter the recording menu, playback menu and a general options menu (which covers system wide selections). The other items allow you to start playing back data now (equivalent to pressing the 'On' button on the front panel), lock the user options (to prevent accidental modification to the settings in trials), check the battery status and to show more about the current settings, detected capabilities and embedded software details. You can also request a system power shut down (equivalent to holding the 'Off' button) form the main menu.

The 'About AntiLog' menu item is an important option which allows you to see a summary of AntiLog's settings, detected options, user selections and current hardware configuration. We recommend you use this feature frequently to check your settings before you commit to recording important data in a trials environment. The about menu feature is described in more detail later in section 10.

5.2 Playback and Menu Port Reset

The playback and menu port settings can be set via the terminal menu system to a wide range of combinations. If the Dual Serial Port option is enabled in the 'General options' menu, then the playback and menu systems can additionally be configured to operate on either the main or the secondary serial port. The default is to use the primary serial port for both the playback and menu system.

If you change the menu or playback port settings and forget what you have set them to (or you suspect someone else has altered the port settings without your knowledge) then there is a simple way to return the playback and menu port settings back to known conditions. With AntiLog switched off, press and hold the 'On' button for at least ten seconds until the LED (top LED for AntiLogPro) turns solid yellow (both red and green segments light up). Release the 'On' button and this will force the playback and menu port settings to the factory defaults. AntiLog will enter playback mode with a flashing green LED. The terminal menu system will be set to the primary serial port with a baud rate of 115200, eight bits per character, no parity and one stop bit. No other settings (e.g. record port settings, playback modes, etc.) are modified during this process and all recorded data is preserved.

5.3 Menu System for Dual Serial Port Use

When dual serial port operation is selected in the 'General Options' menu, dual port recording and/or dual serial port playback can be selected in the 'Recording Options' and the 'Playback Options' menu respectively. In this case, the menu system will always show which channel the current menu refers to when the content is channel specific. To help with the definition of dual port features, you are able to quickly switch backward and forward between the channel settings at various menu levels. In some menus, you are also able to copy the settings from one channel to another at the current menu level to speed up unit configuration.

As an example, most channel specific menus have one or more of the following options present:-

```
[G] Go to the other channel
[+] Copy these options to the other channel
```

Use the <G> item to flick between channel 1 and channel 2 settings at the same menu level. Use the '+' item to copy these settings to the other channel. You will be prompted to confirm this action before the copy actually takes place. Note that the copy is intelligent in that if you copy port settings from one channel to the other, it ensures both ports are not assigned to the same physical serial port hardware.

5.4 Locking User Options

The user is able to change the recording, playback and general options with simple key presses using the terminal menu system in playback mode. However, if AntiLog is accidentally connected to a live source of RS232 data and the unit is powered on in playback mode instead of the intended recording mode, AntiLog will think the incoming characters are user menu input and settings may be altered. If the incoming input stream just happens to have the characters 'REY' at the point when AntiLog is at the root menu, then AntiLog will go into the recording options (<R>), select 'Erase all recorded data' (<E>) and will confirm deletion ('Y').

The user options lock prevents any input in playback mode from altering any of the AntiLog system settings. For this reason, Anticyclone Systems Ltd strongly recommends always using the settings lock feature to protect the settings on your AntiLog unit. It does not stop the unit functioning in playback mode, it just prevents any alteration to the data and/or user settings.

Enabling the lock has been made very easy. Simply type an 'L' key at the root menu and the main menu will change as in the example that follows:-

```
AntiLog-[R] V5.1, Serial number ASL/16/nnn, 28-Feb-2011 12:33:53.042

(3148395 bytes recorded in 1 session, 9% of 30.3MB)
(PLAYBACK mode, Data transfer and 'On' button aware)

 <S> Start playback now (or use 'On' button)
 !LOCKED! Recording options
 !LOCKED! Playback options
 !LOCKED! General options
 <L> UnLock user options
 <B> Battery check
 <A> About AntiLog
 <U> Shut down
?
```

It is now only possible to start data playback (which is always a non destructive action), attempt to unlock the options lock (discussed here later), display more about AntiLog (read only) or to safely shut the system down. Attempts to select other menu items are ignored.

To unlock the options lock, you need to go through a set sequence. With the root menu locked, type 'L' and confirm that you want to release the options lock by typing a 'Y' key at the 'Are you sure?' prompt. The following display shows the screen output to this stage:-

```
Are you sure?

 <Y> Yes
 <N> No
 <Esc>
? Y

==== Unlock User Options ====

 **** Press the 'On' button now to unlock user options ****

 Escape key or 'Off' button to cancel the operation
 <Esc>
?
```

At this moment in time the options lock is STILL active. Press the main green 'On' button to actually release the lock. If instead you press the 'Off' button at this point the operation is cancelled and the options lock will remain on. If you type a space character, RETURN or LINEFEED character then the display is refreshed waiting for the 'On' key once more but no other actions are taken. Any other keyboard input will cancel the unlock operation and the options lock will remain on.

5.5 Battery Check

A battery check will show the current condition of the AntiLog power source. The testing is performed against the current power supply input which is either through the external DC socket or via the internal PP3 clip connection. Note that if a PP3 battery is fitted but an external power source is simultaneously applied with a terminal voltage higher than the PP3 voltage, then the test results will relate to the external power source, not the PP3 battery. Select the <B> item at the AntiLog main menu to show the battery condition check menu.

```
 ==== Battery Condition Check ====

 If power goes off during a check then battery needs replacing.
 A check will take approximately 20 seconds to complete.

 <B> Start a battery condition check
 <Esc>
?
```

Select the <B> item in the 'Battery Condition Check' menu to actually perform a battery check. During the check, a number of '#' characters are filled into a bar style display as shown below. When all of the '#' characters have been drawn (which will take no more than about 20 seconds), the test results are shown. An example of a typical battery condition check follows.

```
 Performing battery condition check
 [####################]

 *** Test Results:-
 *** Battery voltage, min load = 9.0V
 *** Battery voltage, max load = 8.9V
 *** ADVISE: More than 24 hours remaining
 *** Testing complete
```

If the bar display appears to lock up (i.e. The display is not completed within about 20 seconds) then the check detected that the supply had fallen below an internal cut-off voltage

limit and the unit has automatically shut down. This action indicates the the source battery needs replacing immediately.

You may terminate a battery check when it is running at any time by pressing the 'Off' button. In this case, the battery test will be aborted and no test results are reported.

5.6 Turning Your Unit Off

To turn off AntiLog at any time, press and hold the 'Off' button for more than one second until you see red and green LED segments light up simultaneously for a brief period indicating the shut down request has been actioned, and then release the 'Off' button. It is not possible to turn off the unit by briefly touching the 'Off' button. This feature helps prevent accidental shut down incidents which could be caused by knocking into the buttons in a trials environment.

However, you are also able to shut down AntiLog from the main menu. Select the <U> item at the main menu and AntiLog will ask you confirm the action:-

```
Shut down...

Are you sure?

 <Y> Yes
 <N> No
 <Esc>
?
```

Type a 'Y' key to proceed with the shut down or an 'N' key (or any other key other than the space bar which will just refresh the display) to cancel the request.

6. Operation Overview

6.1 Recording Channels

There are two recording channels built into AntiLog V5.1. If you configure your unit for dual serial port operation you can think of each channel as being a separate single channel AntiLog unit. Therefore, each channel can be completely independently configured for use and each has its own hardware serial port connection. For single serial port operation, all recording and playback is performed on channel 1. By default, channel 1 is assigned to the primary serial port and channel 2 is assigned to the secondary serial port hardware but you can choose to swap them over if you wish using the AntiLog terminal menu system.

For AntiLogPro OEM hardware, you can choose from three hardware serial port sources for each logging channel. The primary serial port, the secondary serial port and a third CMOS level auxiliary serial port available from the internal J3 pin header.

Each channel can define its own response to 'On' and 'Off' button pushes whilst in the recording mode. You can assign equipment user commands and log events from button pushes during the record mode. Each channel has its own independent polling mechanisms which can even output messages on the other channel output port if required. You can for example easily log selected GPS NMEA sentences on one channel and poll a radio frequency power meter for readings at a user defined rate whilst recording its output on another.

6.2 Single Serial Port Mode

With the standard single serial port configuration you must perform all serial port activities through the one primary hardware serial port. For example, this means you will need to disconnect the recording data source from the AntiLog serial port connector to plug in a NULL modem cable or equivalent for data replay into a host computer such as a PC. You are also only able to record or play back into a single RS232 connection.

When recording data in single channel mode, AntiLog is designed to look like a PC COM port so that equipment designed to plug into the serial port of a PC will plug straight into AntiLog without any need for additional cabling.

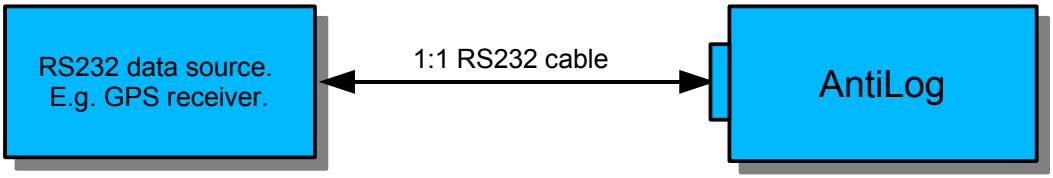


Figure 4: Single port recording configuration

If the cable connecting the equipment to AntiLog is incorrect or the baud rate specified within AntiLog does not exactly match that of the source data, then successful recording will not be possible.

When playing back data in single channel mode, the connection appears as though it is coming *from* a PC. To connect AntiLog to a real PC therefore requires a NULL modem cable. A NULL modem cable crosses over the transmit and receive lines as well as handshake lines to achieve successful communications. A NULL modem cable is supplied with a boxed AntiLog unit.

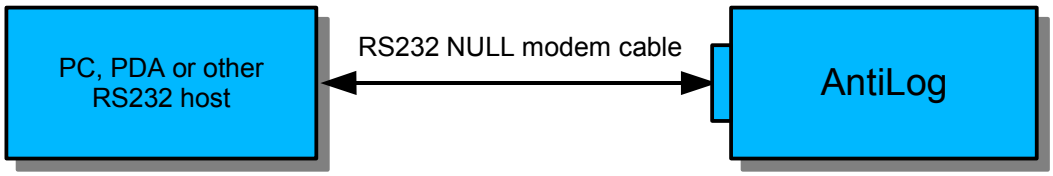


Figure 5: Single port playback configuration

If the cable is not correct, or the host machine (e.g. a PC) is not configured to the baud rate and data bits which exactly matching the AntiLog settings then successful communication will not be possible.

If the Dual Serial Port mode is not active or it has been deselected, then the RTS/CTS line functionality is available in the playback menu options. If dual serial port mode is enabled, the RTS/CTS lines become the secondary serial port transmit and receive lines.

6.2.1 Half duplex bus snooping.

In single serial port mode you can 'listen in' to one of the lines on an existing RS232 connection without upsetting the data flow because AntiLog does not require any form of handshaking to slow down the data source. To listen to a single line on an existing connection, you need a connection from the primary AntiLog Receive Data (Rx1) line and ground (GND) to the cable RS232 signal line of interest (normally pin 2 or 3 on the equipment connector depending on whether you want to listen in to the Transmit or the Receive line) and Ground. See section 18 for AntiLog connector wiring details.

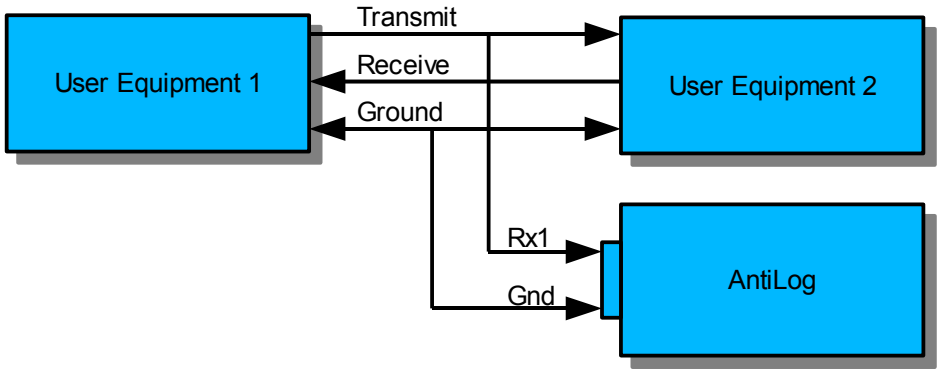


Figure 6: Example of single port bus snooping

A half duplex bus snooping adapter cable is available from your local AntiLog supplier if you do not want to construct a cable for your own application.

6.3 Dual Serial Port Mode

If you have hardware revision C or later, you may select the Dual Serial Port operating mode. In Dual Serial Port mode, AntiLog is able to use the primary serial port and an additional secondary serial port for all data recording, playback and terminal menu system activities. A special 'V' or 'Y' shaped lead is used to plug into the single AntiLog 9 way D connector to give two 9 way D connections, each of which look like PC serial ports to connected equipment.

If you need to log the output from two pieces of equipment at the same time, you can use the following configuration. Note the data paths below are shown bi-directional because you can independently transmit user commands as well as receive data from the two serial ports.

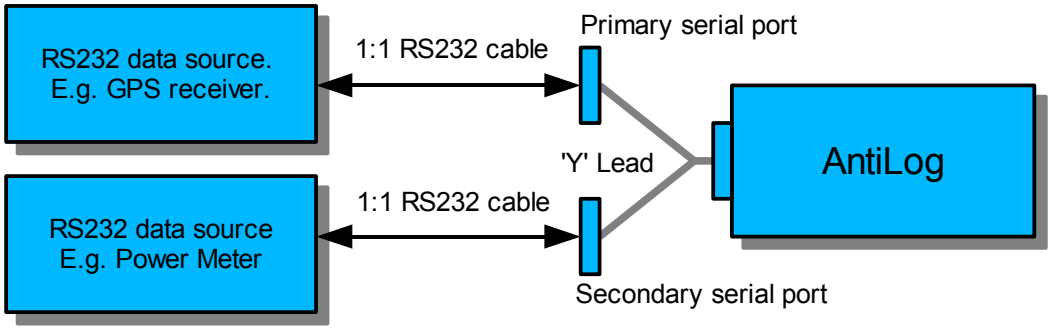


Figure 7: Recording from two data sources simultaneously

The terminal menu system is used to configure independently which AntiLog serial ports are used for record, playback and for the terminal menu itself. The ability to assign which port is used for the different serial port functions greatly increases the flexibility of the system and can simplify installation in completely standalone installations.

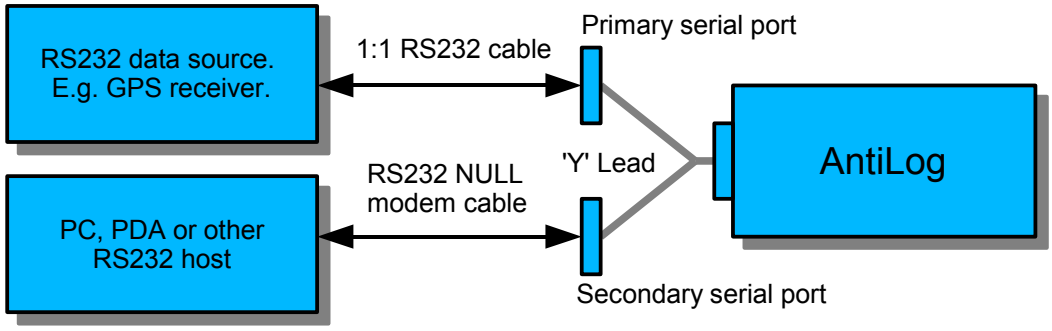


Figure 8: Example dual serial port configuration

The 'V' or 'Y' lead is also used if you need to play back on both channels at the same time.

6.3.1 Dual serial port on the OEM product

The boxed AntiLog product requires RS232 line levels on both the primary and secondary ports to function. The OEM designs allow a configuration to provide a direct connection to CMOS 3V3 RS232 levels (on the secondary and auxiliary serial ports only) when in dual serial port mode. This allows data logging from direct connections to OEM equipment that does not contain RS232 level shifting hardware (such as most OEM GPS receiver modules). See the OEM supplement supplied with the AntiLog OEM product for more details on how to access the CMOS RS232 levels.

6.3.2 Full duplex bus snooping.

In dual serial port mode you can 'listen in' and record both data paths on an existing RS232 connection without upsetting the data flow. You need to connect one of the signal lines to the primary AntiLog Receive Data (Rx1) input and the other signal line to the secondary AntiLog Receive Data (Rx2) input. You also need to connect the AntiLog ground (Gnd) to the cable ground. See section 18 for AntiLog connector details.

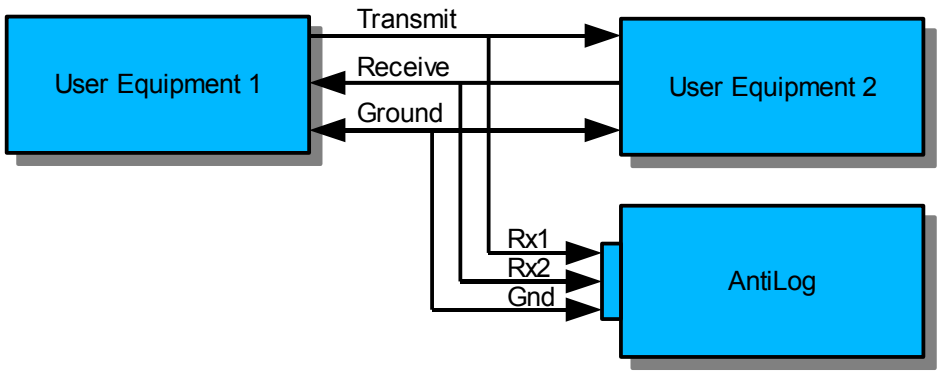


Figure 9: Example of dual port bus snooping

A full duplex bus snooping adapter cable is available from your local AntiLog supplier if you do not want to construct a cable for your own application.

6.4 The Recording Mode

If you press the 'On' button momentarily (i.e. hold it for less than 1¾ seconds) when the unit is powered down then the unit will switch on and enter the recording mode. The bi-coloured LED (lower LED on AntiLogPro hardware) will light red for a second or so and then flash red to show the unit is in recording mode. The unit is now recording any data seen on the 9 way D connector using your selected recording method. For the original AntiLog hardware, you will know if data is being written to the flash store because the panel LED will flashes once in red and then flash one or more times (depending on the data filtering currently selected, see section 19.2) in green and then yellow to represent the two recording channels followed by a pause. If no new data is being written to the flash store, only a single red flash is seen. For AntiLogPro hardware, the top LED flashes green after the lower LED red record flash to show data is being recorded for channel 1 and the lower LED flashes green when data is being recorded for channel 2. The number of green (or yellow for original AntiLog) LED flashes that immediately follow the red flash indicate the data filtering mode active during record.

If AntiLog is configured to record everything it sees on the RS232 port, one coloured flash will appear when data is present for a given channel. If AntiLog is configured to filter incoming NMEA sentences, then two LED flashes will be seen when data accepted by the filter is written to the flash media store. If the ASCII line sub sample filter is enabled, then four LED flashes will be seen when the accepted filtered data is written to the flash media store. To see a table of these flash codes, see section 19.2.

6.4.1 Terminating a recording session

To terminate a data logging session, the 'Off' button is used. However, you cannot simply press the 'Off' button momentarily to turn the unit off, you must hold it down for at least one second to terminate the logging and to turn the power off. This feature helps to reduce the incidence of data recording loss due to accidental activation of the 'Off' button by knocking it during trials and it also allows user events to be logged using a normal momentary push of the 'Off' button during the record process. When you do attempt to terminate a logging session, you will see both red and green LED segments light up simultaneously for a brief period indicating the shut down request has been actioned.

You may repeat the 'On' and 'Off' cycling of the power in record mode as many times as required to append more data to the AntiLog media store without the fear of losing data

already stored. Data is simply appended to the current media store in a new session. Every time you switch the unit on and start recording more data, AntiLog will create a new time stamped session. During playback, it is possible to embed this session information into the playback data stream so you know when each logging session commenced.

If the storage media is ever completely filled (and the Ring Buffer recording method and AntiLogPro is not active), the unit will stop recording and the panel LED will flash five times followed by a pause, continuously. It is therefore not possible to overwrite (and hence delete) recorded data with any new data at the RS232 port.

6.5 Playback Mode

With AntiLog switched off, press and hold the 'On' button for more than 1¾ seconds until the bi-coloured LED shines green (top LED for AntiLogPro hardware). At this point you can release the button and the unit is in playback mode. The bi-coloured LED will now flash green to indicate playback mode. If you have a terminal program connected to AntiLog set to the current AntiLog playback baud rate then you will see the main menu on the terminal's display.

With the unit already power up in playback mode, you can press the 'On' button again momentarily to start the replay of recorded data straight from the AntiLog store. You can alternatively initiate playback from the terminal menu system. Data can be replayed at full rate, or you can use a real time playback mode for selected types of recorded data to simulate the source equipment's original output. There is also an option to play back the data as a combined hexadecimal and ASCII dump for low level equipment data analysis.

When playing back data, you must use the 'Off' button if you wish to stop output early. Menu keyboard input during playback has no effect. The 'On' button can be used to restart playback from the beginning of the recorded data store even if the unit is currently playing back data. Pressing the 'On' and 'Off' buttons in this way can be repeated as may times as required.

The number of green (or yellow) LED flashes that immediately follow the playback green flash indicate the playback mode active for each channel. For the original AntiLog hardware, green flashes represent the state of the first recording channel (Channel 1) and any following yellow flashes represent the state of the second recording channel (Channel 2). For AntiLogPro hardware, the top LED green flashes represent the state of channel one and the lower LED green flashes represents the state of channel two. See section 19.3 for more details on the playback flash codes. When configured for single channel playback, only green flashes following the first green playback flash will be seen (top LED for AntiLogPro hardware).

6.5.1 Playback connections

When playing back data in single channel mode, the connection appears as though it is coming *from* a PC. To connect AntiLog to a real PC therefore requires a NULL modem cable. A NULL modem cable crosses over the transmit and receive lines as well as handshake lines to achieve successful communications. A NULL modem cable is supplied with a boxed AntiLog unit.

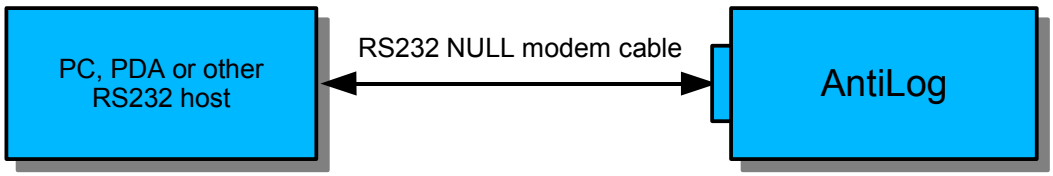


Figure 10: Playback configuration

If the cable is not correct, or the host machine (e.g. a PC) is not configured to the baud rate and data bits which exactly matching the AntiLog settings then successful communication will not be possible.

When dual serial port playback is required, the 'V' or 'Y' lead can be used to provide the two serial port outputs from the single AntiLog connector on the end panel.

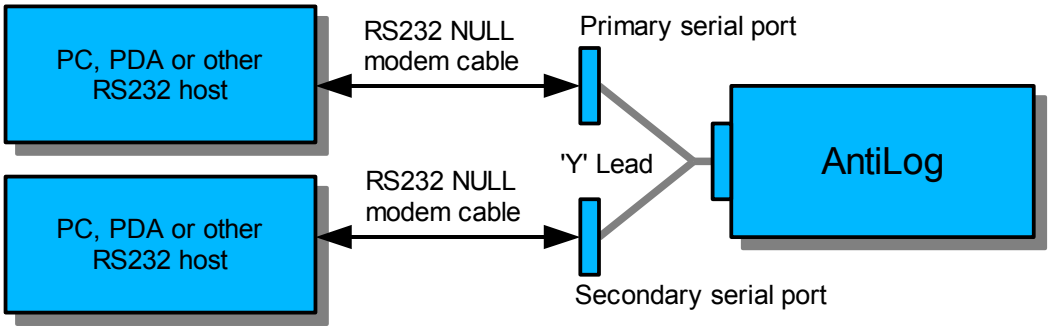


Figure 11: Dual serial port playback

6.6 Erasing Stored Data Using the Panel Buttons

Normally, you would erase all stored data in AntiLog via the terminal menu system. However, it is possible to erase all stored flash data using the 'On' and 'Off' buttons together during power up if required. To do this, ensure the unit is switched off then hold down the 'Off' button. Whilst holding it down, press and hold the 'On' button until the LED lights up green indicating the unit has started in playback mode. Now release both buttons. The same LED turns solid yellow briefly (both red and green segments light up) to confirm the erase operation has been actioned. If you have a terminal connected to AntiLog a message appears informing you that the media has been erased. If you do not hold the 'On' button down for long enough, the system will not power up and no data will be erased. This is done to prevent accidental media erasure which could be caused by accidentally pressing both buttons simultaneously for a short period of time with the power off.

You may not want this two button erase sequence to be available to operators in the field for critical trials work so it is possible to disable this facility using the terminal menu system. In this case, the only way data can be erased from the system is via the terminal menu system.

6.7 AntiLog Date and Time

AntiLog references all dates to the 1st January 2000 and time is maintained as the number of milliseconds since midnight. If your original AntiLog system does not contain Real Time Clock hardware then any date and time information displayed or written to the file system defaults to relative time from switch on (amount of time elapsed assuming switch on was 1st January 2000 00:00:00.000). Even without Real Time Clock hardware, you can enter date and

time manually from the terminal menu system and enter into the recording mode directly from the menu system to allow data recordings to appear with real date and time stamps.

AntiLog is able to date and time stamp recording sessions, events and ASCII line data. The system maintains a software clock and the battery backed hardware real time clock (if available). The internal software clock is used to maintain time and date in normal operation. However, if power is removed (i.e. the unit is switched off), these date and time values are lost. When AntiLog is switched on, the software clock is set automatically from the hardware Real Time Clock (if available) or it defaults to the 1st January 2000, 00:00:00.000.

It is now possible to transfer date and time from one AntiLog unit (running V3.1d and above) to any other AntiLog unit running any V3 or later version of the embedded software. (See section 7.1.1).

Date and time stamps are generally maintained with at least 1mS resolution but time stamp accuracy can be effected by poor FLASH media performance.

6.8 User Equipment Commands

V5.1 allows you to define up to four user equipment commands which can be transmitted to connected equipment in record mode. For a given recording channel, you can assign user equipment commands to the 'On' and 'Off' buttons and/or assign one to the channel's polling feature. In this way, you are able to poll equipment periodically for measurements (e.g. from a power meter) and issue commands such as equipment reset or configuration requests using the 'On' and 'Off' buttons during record. Section 8.9 describes the User Equipment Command system in more detail.

Note that there is a maximum of four user equipment commands shared across both recording channels. If you change the definition of a user command, it may effect both channels.

6.9 Automated Data Recovery

When AntiLog is in record mode, all data collected is written to the single media FLASH store. When the 'Off' button is pressed and held, AntiLog will automatically flush the current recording buffer (up to 508 bytes) to the media store, update the media directory entry and then power down the unit. If the internal battery slowly discharges below 4.25V then AntiLog switches itself off as though the user pressed and held the 'Off' button. In both these cases, the current recording buffer and the directory entry are processed and flushed to the media store before the unit is actually switched off.

However, if no internal main battery is fitted and an external supply is used, media storage problems can occur. If the supply power is simply switched off during record then AntiLog does not have enough time (or power left) to flush the current recording buffer and update the directory entry and so when the system is next powered up in playback mode, it will appear that no data has been recorded (the directory entry will not have changed).

The AntiLog software can detect this situation and will automatically rebuild the entire directory structure including session information as soon as the unit is powered up again in either record or playback mode. During media data recovery, both LED segments are flashed together (yellow). When the recovery has finished, AntiLog continues with data recording or the playback mode. In the playback mode it is possible to view the recovery in progress on

the terminal screen. You may press the 'Off' button during media data recovery if you want to abort the recovery action and make no changes to the directory structure.

Data recovery can be initiated at any time from within the General Options menu. Media data recovery will even 'undelete' data which was erased from the Recording Options 'Erase' menu.

The media data recovery feature is unable to recover any data that was in the 508 byte recording buffer when power was removed. This means that up to a maximum of 508 bytes may be lost if power is suddenly removed from AntiLog instead of using the 'Off' button to shut the unit down in recording mode.

6.10 Media Compatibility

AntiLog V5 uses a dual port file system. This new file system is backward compatible with all previous AntiLog versions but is designed to be more interoperable when using media card readers fitted to a PC. It supports MultiMedia Card (MMC), Secure Digital (SD) and Secure Digital High Capacity (SDHC) media up to 32GB. It also supports MiniSD, MicroSD and SDHC versions of these cards when fitted into an SD card adapter.

AntiLog does not use the Microsoft FAT filing system for data storage, but if you ever need to remove the media card from an AntiLog system and fit it into a PC media card reader then the V5 file system is more 'FAT friendly' in that it does not write to FAT sensitive areas of the media. You still need special application software to remove the recorded data from the media but in AntiLog V3.2 systems and earlier, the File Allocation Table used by the FAT system could be overwritten which could cause the PC to not recognise media placed into a media card reader slot.

6.11 Digital Bit State Logging

V5.1 has the ability to log the state of selected digital input lines on the AntiLog hardware and insert these as events or messages in a channel's log file. This may help you monitor the status of one or more discrete output lines from your equipment.

You can configure AntiLog to record the current digital bit state in response to a button push or you can use a channel's polling function to record the bit state at a user defined rate. Currently, the following digital lines are able to be monitored:-

Bit number	Pin Assignment	Pin location	AntiLog boxed	AntiLog OEM	AntiLogPro boxed	AntiLogPro OEM
1	Secondary serial port	9-Way: Rx2, pin 8	✓	✓	✓	✓
2	Secondary serial port	J3: Tx2/RTS, Pin 15	×	✓*	×	✓
3	Primary serial port	9-Way: Rx1, pin 2	✓	✓	✓	✓
4	Event Input	J3: Event_In, Pin 9	×	✓*		
5	Aud1,VBACK	J3: Aud1, Pin 10	×	✓**		
4	Event Input	J3: EventIn, Pin 17			✓***	✓

Bit number	Pin Assignment	Pin location	AntiLog boxed	AntiLog OEM	AntiLogPro boxed	AntiLogPro OEM
5	Auxiliary Rx	J3: Pin 19			✗	✓
6	Auxiliary Tx	J3: Pin 20			✗	✓
7	D4	J3: Pin 21			✗	✓
8	D5	J3: Pin 22			✗	✓
9	DB9 Pin 1	9-Way, pin 1			✓	✓

* *Not applicable to AntiLog hardware revisions less than C.*
** *Not accessible on AntiLog hardware revision F.*
*** *EventIn is also routed to 9-Way connector pin 9 on AntiLogPro boxed version.*

Note that bits 1 and 3 will be inverted if you use the 9 way D connector inputs for these signals rather than CMOS levels (on the OEM version for example). The reason is because these RS232 inputs go through an inverting function before they reach the microcontroller. The advantage to using the RS232 inputs as digital input lines is the wide voltage range these inputs will tolerate (-20 to +20V) which will often mean that external level conversion is not a requirement to log the signal line state from user equipment.

A digital bit state event is inserted into a channel log file as a single ASCII event message line. The event records each logic input level as either a logic 1 or 0. The format of the digital bit monitor event is as follows (format depends on whether the 'Add explicit date and time text to inserted $EVENT messages' item is enabled in the 'Record Time Stamping Options' menu):-

```
$EVENT,DMON,n,d1,d2,d3,d4,.....dn*csum
$EVENT,DMON,n,d1,d2,d3,d4,.....dn,f,date,time*csum
```

Where:

`n` = Number of digital bit states recorded in this message
`d1` to `dn` = 'n' lots of bit state readings, each either a '0' to a '1'.
`f` = Date and Time flag. 'V' for Valid date and time, 'R' for relative date and time.
`date` = Date string. Format defined in 'System Time and Date Options' menu.
`time` = Time string as HH:MM:SS.sss (millisecond resolution)
`csum` = NMEA compatible EXOR checksum

The following is an example of a digital bit state event (example from AntiLogPro hardware):-

```
$EVENT,DMON,5,1,0,0,1,1,V,05-Mar-2010,19:22:55.190*50
```

7. General Options Menu

Type a 'G' at the main menu to enter the 'General Options' menu. This menu is important because it is used to configure whether the entire AntiLog unit can be used in single or dual serial port mode. It also allows access to the system date and time options as well as the menu system settings, start up and general system features. Additionally, the general options menu gives access to the User Option Storage menu and provides an menu item to initiate embedded software upgrades.

```
==== General Options ====
(Data transfer and 'On' button aware)

 <T> System time and date options
 : :
*[P] Menu system on playback port settings
 <U> Menu system on user defined port settings
 [Q] Menu is not displayed until key press (Quiet)
 : :
 [D] Enable dual serial port operation
*[E] Keypad two button hold ERASE enabled
 : :
 <M> Media data recovery
 <O> User option storage
 <R> Reset current user options to factory defaults
 <B> Power management and start up (Boot) options
 <!> Perform embedded software upgrade
 : :
 <S> Start playback now (or use 'On' button)
 <Esc>
?
```

7.1 System Time and Date Options

Select the <T> item to enter the 'System Time and Date' options menu. If your system does not contain Real Time Clock hardware and a date and time has not already been manually entered, the following menu appears:-

```
==== System Time and Date Options ====
(Data transfer and 'On' button aware)

(No Real Time Clock hardware detected)

 !!! Current time and date not valid !!!

 <T> Enter new system time and date
 : :
*[0] Format: dd-mmm-yyyy HH:MM:SS.sss e.g. 20-Apr-2008 12:45:30.325
 [1] Format: dd/MM/yyyy HH:MM:SS.sss  e.g. 20/04/2008 12:45:30.325
 [2] Format: ISO 8601 date and time   e.g. 2008-04-20T12:45:30.325
 : :
 <S> Start playback now (or use 'On' button)
 <Esc>
?
```

Use the keyboard Enter (or Return) key or space bar to update this menu and hence show the current time if a valid time and date is set.

Use this menu to select how you would like the date formatted in AntiLog. Select either text format ([0]) or numeric format ([1]).

Use the <T> item in this menu to enter a date and time manually. You must enter a time *and* a date to have the entry accepted. Anticyclone Systems Ltd recommend you always use UTC time and date for data recording to ensure you don't get confused with time zones during data analysis.

```
==== New Date and Time Entry ====

  Date formats: dd-mmm-yyyy, dd/mmm/yyyy, dd-MM-yyyy or dd/MM/yyyy
  Time formats: HH:MM:SS.sss, HH:MM:SS or HH:MM
  Example: 04-Apr-2008 23:30:45 (Use 'Control-P' to edit the current date and time)

New Date and Time:
```

The date and time are only set when you hit the Enter or Return key at the terminal, so it is possible to type in a date and time slightly ahead of real time and hit Enter at the moment the time and date become valid. This will set the date and time as accurately as possible from keyboard input. You can edit the current time and date value by typing Control-'P'.

If a real time clock is present, the entered time and date will be written to it during this process, else the time and date will be valid while the unit remains in playback mode with the power on. You can use the 'Record Data Now' option in the Recording menu to use this date and time without powering down your unit so that recording time stamps contain valid time and dates.

Internally, all time and dates are related to 1st January 2000 at midnight. If no real time clock is available, this time will be set at power up and all timing will be relative to this time and date. See the description of AntiLog date and time in section 6.7 for more details.

7.1.1 Date and time transfers to other units

If you need to use a number of AntiLog units in a trial, it is a good idea to ensure the date and time held on each is as accurate as possible. To transfer date and time effectively from one unit to another (and to save time setting up your units) use the date and time transfer function in the 'System Time and Date Option' menu.

Ensure all units ready to receive time and date are switched on in playback mode with the same menu serial port settings as this transmitting unit and also ensure the settings locks are off on all receiving units.

```
==== System Time and Date Options ====
(Data transfer and 'On' button aware)

(Real Time Clock hardware detected)

 04-Apr-2008 14:38:20.753

 <T> Enter new system time and date
 : :
 <X> Perform time transfer to another AntiLog unit
 : :
*[0] Format: dd-mmm-yyyy HH:MM:SS.sss e.g. 20-Apr-2008 12:45:30.325
 [1] Format: dd/MM/yyyy HH:MM:SS.sss  e.g. 20/04/2008 12:45:30.325
 [2] Format: ISO 8601 date and time   e.g. 2008-04-20T12:45:30.325
```

```
   : :
   <S> Start playback now (or use 'On' button)
   <Esc>
  ?
```

Select the <X> item to enter the time transfer mode on the transmitting unit.

```
==== Time Transfer to another AntiLog Unit ====

 Replace this terminal connection now with a NULL modem connection
 to each AntiLog unit in turn to transfer date and time.

 Press the 'On' button on this unit to perform each date and time transfer.
 <Esc>
?
```

Connect a NULL modem cable from this unit to the first AntiLog unit to receive date and time and press the 'On' button on the transmitting unit. Wait about two seconds and then you can disconnect and reconnect additional units as you want, pushing the 'On' button to perform the date and time transfer to each.

The units that receive date and time in this way should be synchronised to within about a millisecond of each other when the transfer occurs. Note that the receiving AntiLog units do not need to be running V5.1 to accept the date and time. All V3.0 and above versions will accept time transfers. However, you need V3.1d (or above) to support transmitting date and time.

7.1.2 1PPS time synchronisation output

For some trials work, an accurate time reference is an important part of the data collection process. One of the advantages to logging data on a dual channel data recorder is that the two data sources share a commonly synchronised time source for time stamped data. The OEM version of the AntiLogPro hardware extends this concept one stage further and offers a means to synchronise many other pieces of equipment that accept a 1 pulse per second (1PPS) input, including other AntiLog data units.

Although no time value itself is transmitted over the 1PPS interface, you can use the fact that it is always on a 1 second boundary to post process corrections for other equipment whose time is perhaps slowly drifting with respect to the reference AntiLog unit which is transmitting the 1PPS source. For example, you could connect one or more AntiLog units to the first via their 'EventIn' lines and log those EventIn events which will give you time stamping to 1mS resolution when you post process all of your data.

The AntiLogPro hardware transmits a 1PPS square wave output on the dedicated '1PPSout' header pin (pin 23 on on J3) with a 50% duty cycle. The positive edge represents the on-board 1 second epoch time reference (start of every 1 second count).

7.2 Menu System Port Settings

By default, the terminal menu system is displayed on the serial port assigned for data playback ([P] selected in the 'General Options' menu). In this case, changes to the playback port settings (channel 1) will automatically apply to the menu system.

Use the <U> menu item in the 'General Options' menu to define the terminal menu system's own serial port settings which are then independent of any other settings. If the Dual Serial Port option is enabled, you can assign the menu system to one port and the data playback to another. This would then prevent any menu display text being transmitted to equipment connected to the playback port.

If you request the 'Reset all options to factory defaults' item from the main 'General Options' menu, the menu port settings are reset to defaults and the menu system is linked back to the playback port.

7.3 Menu Quiet

If the Menu Quiet ([Q]) item is selected, AntiLog will not display the opening system menu until the user has entered a key (such as the space bar or return keys). This can be useful if you want AntiLog to transmit recorded data to equipment exactly as it was recorded without the main AntiLog system menu being transmitted to the equipment first if the terminal menu is assigned to the playback serial port. Press and hold the 'On' button to put AntiLog in playback mode and then push the 'On' button again to start transmitting data. The AntiLog menu won't appear at the end of the transfer until a key has been pressed even if the menu quiet option is not selected.

Please note that with Menu Quiet selected, other users who may have used older versions of the AntiLog embedded software may think your AntiLog unit is not functioning because a menu does not appear in playback mode. You can always use the keyboard Space bar or the Return key to refresh any AntiLog terminal menu.

7.4 Enabling the Dual Serial Port Mode

Select the [D] item in the 'General Options' menu to enable/disable the dual serial port feature. When disabled, the primary AntiLog serial port supports RTS/CTS hardware handshaking. When dual serial port mode is enabled, the RTS/CTS lines on this port become the secondary serial port transmit and receive lines and a custom Dual Serial Port cable is required ('V' or 'Y' lead). If the Dual Serial Port feature is not enabled in this menu then dual serial port options in the recording, playback and menu user defined port settings menus will not be available.

If you do not need to use the dual serial port feature for record or playback, don't enable it. This will simplify the menu system and the RTS/CTS lines will default to the correct line state (even if RTS/CTS playback handshaking for the serial port is not actually selected). In dual serial port mode, the RTS/CTS lines are the second serial port and when these are idle, they are not in the correct state for RTS/CTS handshaking. For this reason, you should always use a custom Dual Serial Port cable for dual serial port mode or ensure that equipment connected to AntiLog (e.g. a PC) is not configured for hardware handshaking.

7.5 Two Button Erase

If you are working on important trials you may want to minimise the chances of losing important recorded data. As such, you can disable the ability of a user in the field to erase the contents of the flash media by holding down the 'Off' and the 'On' buttons at start-up (See section 6.6). If a star character (*) does not appear to the left of the menu item then the only way to erase stored data is via the 'Recording Options' menu using a serial port terminal.

```
[E] Keypad two button hold ERASE enabled
```

7.6 Media Data Recovery

Select the <M> option in the 'General Options' menu to force the Media Data Recovery feature to start. You will be asked for confirmation and then the recovery will take place. On screen you will see progress made so far, both red and green LEDs will flash together and the 'Off' button can be used at this time to terminate the action without making any changes to the media store.

When data recovery has finished, AntiLog returns to and displays the main menu. You can then see exactly how much data and how many sessions have been recovered.

Note that the media data recovery feature can even 'undelete' data which was erased with the Erase All item in the 'Recording Options' menu as long as no new data has been written to AntiLog in record mode since the erase command was issued.

7.7 User Option Storage

You can save and load complete sets of user options to prevent having to reconfigure a unit using all the menu items each time. Up to four option sets can be saved into non volatile storage which means the saved option sets will not be lost when all sources of power are removed. This feature is useful if you are involved with different projects where the settings are different for each project but you need to share an AntiLog unit between the projects.

```
==== User Option Storage ====

*[1] Store 1: <empty>
 [2] Store 2: <empty>
 [3] Store 3: <empty>
 [4] Store 4: <empty>

 <L> Load into current user options from selected store
 <S> Save current user options to selected store
 <E> Erase selected store
 <Esc>
?
```

7.7.1 Saving a set of user options

To save the current active options to a named options store, first select a store by typing '1' to '4'. The currently selected store is the one marked with a '*' character. Select the <S> item to request a save. You will be prompted to enter a descriptive name for the new option set. The store name can be up to a maximum of 32 characters and doesn't have to be unique.

```
Enter a new store name for these options.
 - You must use the 'On' button to confirm, 'Off' button or <Esc> key
   to abort.
 - Use Control-P to edit the existing store name.

New store name: Ch1=My Inertial Nav, Ch2=My GPS
```

While entering the store name, you can pull back the existing name for this store for editing (if present) using the Control-'P' keyboard combination. The store name can contain spaces and printable characters such as +, _, &, etc. If you do not enter a store name but proceed with the save operation then the name will appear in the list as <no name>.

Press the 'On' button to confirm the save operation or the 'Off' button or terminal Escape key to abort the operation. Pressing the 'On' button will start the saving process and you may have to wait a few seconds for the process to complete.

```
[Saving current options, please wait...Save complete]
```

Pressing the keyboard Enter or Return keys during store name entry will not start the save, you must use the 'On' button to prevent accidental overwriting of stored options from random character input to the menu system. If the store chosen already had options saved to it, these will now be overwritten with the currently active options. The following example shows a set of user options written to store 2:-

```
==== User Option Storage ====

 [1] Store 1: <empty>
*[2] Store 2: Ch1=My Inertial Nav, Ch2=My GPS
 [3] Store 3: <empty>
 [4] Store 4: <empty>

 <L> Load into current user options from selected store
 <S> Save current user options to selected store
 <E> Erase selected store
 <R> Reset current user options to factory defaults
 <Esc>
?
```

7.7.2 Loading a set of user options

Ensure the store number is selected for the set of options you wish to retrieve by entering a number '1' to '4'. The active store is the one with the '*' symbol next to it. Select the <L> item to load the saved set of options into the currently active options.

```
Load options from named store: Inertial navigation+GPS trials

You must use the 'On' button to confirm, 'Off' button or <Esc> key to abort
```

You must confirm the operation using the 'On' button, not the keyboard Enter or Return key. If you push the 'On' button, the loading operation will start and a confirmation will be printed to the terminal screen. The saved settings are now the active settings and you may now need to change your terminal port settings and baud rate to match any changes to the menu port and baud settings (you will be prompted for this if such action is required).

Once a set of options have been loaded, they can be altered as usual using the menu system. For example, it may be quicker to load in a set of known options and modify them rather than modify factory default settings for a given trial.

7.7.3 Erasing a set of user options.

For completeness, if you would like to erase a store's content you can select the store first and then use the <E> item. You must confirm the erase operation using the 'On' button, not the keyboard Enter or Return key. When the erase has completed, the store location will show <empty> for the selected store name. Note that you do not need to erase a selected store before writing new content to that store location, just use the save item as a save will always overwrite any existing store content.

7.8 Power Management and Start Up Options

Select the <B> option from the 'General Options' menu to enter the 'Power Management and Start Up Options' menu. Here you can enable or disable automatic power saving and configure how your AntiLog unit starts up.

```
==== Power Management and Start Up Options ====
(Data transfer and 'On' button aware)

*[A] Automatic power saving enabled
 [F] Always start up in playback mode (Forced Playback)
 <Esc>
?
```

7.8.1 Automatic power saving

Selecting the [A] item in the Power Management and Start Up Options menu enables automatic power saving. In common with other electronic computing devices, it is possible to reduce the overall power consumption if you are able to reduce the effective system clock frequency. AntiLog is able to dynamically change this value to give power consumption savings during operation. When the power saving mode is disabled, AntiLog runs at full clock speed regardless of selected baud rates and whether the unit is in recording or playback mode. Enabling automatic power saving mode allows proportional changes to the system clock frequency based on the selected settings which can for example reduce power consumption by 40% or more when operating with baud rates equal to or less than 38400.

Power saving mode is enabled by default and only has an effect if the combined channel baud rates are less than 115200 for a given operating mode (e.g. playback). AntiLog automatically chooses the optimum microcontroller clock frequency for the current mode of operation. If you are operating AntiLog in recording mode, the recording baud rates and settings are used for this calculation, else the playback and/or menu baud rates are used.

There are no significant disadvantages to using the automatic power save mode for recording data. For playback, there can be a slight reduction in the data transfer rates (<10%) which is only true if a playback baud rate less than 115200 is selected. For this reason, you are able to disable the automatic power saving mode for ultimate playback and recording performance.

7.8.2 Forced playback

If you want to always start your unit in playback mode then select the Forced Playback feature in the 'Power Management and Start Up Options' menu. When this item is selected, AntiLog will always start up in playback mode (e.g. regardless of the length of time the 'On' button is pushed at start up). You can then select recording mode from the playback menu system (see the 'Recording Options' menu, section 8) rather than rely on a short button press during startup. This option is also useful if you want to gain control over a remote OEM ('P' hardware option) unit every time power is applied.

```
==== Power Management and Start Up Options ====
(Data transfer and 'On' button aware)

*[A] Automatic power saving enabled
*[F] Always start up in playback mode (Forced Playback)
 <Esc>
?
```

When active, the main menu will show that forced playback is selected:-

```
AntiLog_OEM-MR V5.1, Serial number ASL/16/001, 03-Oct-2009 11:02:21.203

(135922 bytes recorded in 2 sessions, 0% of 485.2MB)
(FORCED PLAYBACK mode.  Data transfer and 'On' button aware)
```

7.8.3 Forced playback via 'EventIn' line

For AntiLog OEM customers that have the 'P' hardware option installed, there is a feature added to allow units to automatically power up in playback mode rather than the default record mode based on the state of the 'EventIn' pin on the J3 OEM header. If the 'EventIN' pin is held low when power is applied (and this feature is enabled in the menu system) then the unit will always start up in the playback mode.

An extra menu item appears in the new Power Management and Start Up Options menu to allow you to define this start up behaviour. An example follows which shows 'EventIn' forced playback enabled.

```
==== Power Management and Start Up Options ====
(Data transfer and 'On' button aware)

*[A] Automatic power saving enabled
*[P] Setting OEM line 'EventIn' low forces playback mode at start up
 [F] Always start up in playback mode (Forced Playback)
 <Esc>
?
```

Note that the `[P]` item shown in the example will not be selectable if 'Forced Playback' is instead enabled.

7.9 AntiLog Software Upgrades

The embedded AntiLog software can be upgraded via the serial port. Instructions on how to do this are supplied with a specific upgrade. If you decide to select this item you will be asked if you really want to do this and if you confirm this action, the system bootloader will be activated.

If you accidentally activate the bootloader, simply switch the unit off as normal by holding the 'Off' button down for at least one second. When you next switch the unit on, it will run the existing software again as normal.

Note that if your system is a custom solution which is not supplied with the bootloader option, the '`!`' menu option will not be present and you cannot upgrade the embedded software via the serial port.

7.10 Restoring Factory Defaults

You can reset the unit to factory defaults to ensure you know the exact state of AntiLog before making changes to the settings yourself. You will be prompted to confirm this operation before it takes place. There is no 'undo' facility!

Setting the factory defaults *does not* erase any existing recorded data on the media and it also does not change any settings saved into the named User Option Management stores. The factory defaults are as follows:

Option	*Default State*
Dual Serial Port Mode	Off
Record baud rate	4800
Record RS232 data bits	8
Playback baud rate	115200
Playback RS232 data bits	8
Playback parity	None
Playback stop bits	1
Menu system locked to playback port	Yes
Menu Quiet	Off
Menu system baud rate	115200
Menu system RS232 data bits	8
Menu system parity	None
Menu system stop bits	1
Record data filter	Record All
Time stamp line data	Off
Date and time added to $EVENT messages	Yes
End Of Line Character Selection	Auto
Record 'On' and 'Off' button events	Disabled
Record 'On' button sends user command	No
Record LEDs enabled	Yes
Playback LEDs enabled	Yes
Playback mode	RAW
Playback insert session headers	Off
Playback insert time stamps	Off
Playback RTS/CTS handshaking	Disabled
Two button erase	Enabled
Automatic Power saving mode	Enabled
Forced Playback	Off
Asserting 'EventIn' forces playback mode	Off
Escape key can abort playbacks	Off
Lock User Options	Off

Note that if your hardware supports Dual Serial Port operation, the Dual Serial Port Mode in the 'General Options' menu will be disabled by default. However, it is possible to force this to enabled by default as a factory set option for those who will always using the system in the dual serial port configuration.

8. Recording Options Menu

The 'Recording Options' menu available from the main menu controls how AntiLog records RS232 data in record mode. The actual menu content may vary depending on the hardware you are using, whether dual serial port mode has been enabled in the 'General Options' menu and whether the 'Dual channel data logging' item is selected. The following example shows a typical 'Recording Options' menu using AntiLogPro with dual serial port enabled in the 'General Options' menu, but not selected here for record (single channel record):-

```
==== Recording Options ====

 [D] Dual channel data logging
 : :
 <P> Configure serial port {M:115200,8,N,1,-}
 : :
 <M> Recording method {Record All}
 : :
 <T> Time stamping {none}
 <X> Define ASCII end of line character
 <1> 'On' button actions
 <2> 'Off' button actions
 <U> User equipment commands and polling functions
 <I> Event logging options for 'EventIn' digital input
 : :
 <W> Media write options {Normal logging}
 : :
*[L] Panel LEDs enabled
 <E> Erase all recorded data
 <R> Record data now
 <Esc>
?
```

1. *The "Media write options" item only appears on AntiLogPro hardware*
2. *The "Event logging options" item only appears for OEM versions of the hardware*

8.1 Dual Channel Data Logging

Select the '`[D] Dual channel data logging`' item to toggle between single and dual channel recording mode. Note that this item will not be available if dual serial port mode is switched off in the 'General Options' menu. The 'Recording Options' menu changes to the example below if dual serial port record is selected:-

```
==== Recording Options ====

*[D] Dual channel data logging
 : :
 <1> Configure data recording for Channel 1
 <2> Configure data recording for Channel 2
 : :
 <W> Media write options {Normal logging}
 : :
*[L] Panel LEDs enabled
 <E> Erase all recorded data
 <R> Record data now
 <Esc>
?
```

Enter a '1' to edit channel 1's options, enter a '2' to edit channel 2 options. The Media writing options and the other items in this menu are not channel specific.

8.2 Configuring a Serial Port for Record

Use the configure serial port (<P>) option in the 'Recording Options' menu to set the serial port baud rate and number of RS232 data bits per character to use when recording data. If Dual Serial Port operation is selected in the 'General Options' menu, this option also allows you to specify which port is connected to the data source and you will see options [1] and [2] as displayed in the following example, otherwise these options will not be present.

```
==== Record Serial Port Settings {M:4800,8,N,1,-} ====

*[1] Record from main serial port
 [2] Record from secondary serial port
 [3] Record from auxiliary serial port
 : :
 <B> Set serial port baud rate
 [5] 5 data bits
 [6] 6 data bits
 [7] 7 data bits
*[8] 8 data bits
 : :
*[N] No parity
 [E] Even parity
 [O] Odd parity
 [T] Two stop bits
 : :
 <I> RS232 signal line inversion
 <Esc>
?
```

1. *The "RS232 signal line inversion" item only appears on AntiLogPro hardware*
2. *The "Record from auxiliary serial port" item only appears on AntiLogPro OEM hardware*

Select <B> to enter the baud rate select sub menu (see section 11). You can also use this menu to configure the number of data bits, parity and stop bit settings for data recording.

8.2.1 RS232 signal line inversion

AntiLogPro users have an additional sub menu item in the 'Record Serial Port Settings' menu which allows individual RS232 line inversion to be specified.

```
==== RS232 Signal Line Inversion Options ====

*[N] Normal RS232 signal line operation
 [R] Invert Rx receive signal line logic (!R, will read CMOS/TTL RS232)
 [T] Invert Tx transmit signal line logic (!T)
 [B] Invert both Rx and Tx signal line logic (!B)
 <Esc>
?
```

In this way, it is possible to log some CMOS RS232 data sources, such as those transmitted directly from OEM GPS receivers without the need to convert the signals to true RS232 levels first. RS232 line driver level conversion normally involves a logical signal inversion process

and so AntiLogPro is now fully configurable to cope with all combinations of possible data inversion.

Please note that although it is possible to invert the transmit line which would then mean the logic sense is correct for CMOS RS232 transmissions, the drive level output from AntiLogPro is always at RS232 line levels which means you will see negative voltage as well as positive values output from the AntiLogPro transmit pin.

8.3 Recording Method

The 'Recording Method' sub menu allow you to define how AntiLog captures your incoming data. For dual channel capture, these settings can be (and often are) different for each channel. Per channel, you can choose to record all data, record filtered GPS NMEA sentence data or perform ASCII line sub sampling to reduce the amount of collected data.

You can also select the 'do not log' item which prevents incoming serial port data from being logged but does allow Event inputs and digital bit state polling and other forms of internal capture to be logging on that channel. As another example, you may want to use the second channel to output user equipment commands but are not interested in the data it returns and hence you may save on media storage requirements for a given trial.

```
==== Recording Method for Channel 1 ====

*[A] Record all data
 <N> Record filtered GPS NMEA
 <M> Record ICD-GPS-15x
 <S> ASCII line sub sample filter
 [X] Do not log incoming data for this channel
 : :
 [G] Go to the other channel
 [+] Copy these options to the other channel
 <Esc>
?
```

8.3.1 Recording all data

You may wish to record everything that appears at the RS232 port during record mode or have AntiLog automatically filter the data it stores to the flash media. Select the `[A]` item in the Recording Options menu to record everything without any filtering.

If you are recording ASCII line data (e.g. GPS NMEA data), you can optionally select the `<T>` item and choose time and date tagging options for the start of each data line. The line time and date can then be optionally embedded into the playback data stream and can also be used directly to assist real time data playback.

8.3.2 Filtering GPS NMEA messages

If you are logging GPS NMEA sentences, you can choose to record everything using the 'Record all data' item in the 'Recording Options' menu or you can select which NMEA sentences will be logged from a fixed list of GPS NMEA sentence names. Logging only selected NMEA sentences helps to reduce total trial storage requirements and improves data upload times. Recording only selected sentences may even simplify subsequent data processing.

To select which GPS NMEA sentences to record, select the `<N>` item in the Recording Options menu and then select which sentences to record. A star ('`*`') to the left of the

keyboard option indicates that this sentence will be recorded and it is toggled each time the menu item is selected. Incoming sentences which are not selected in this list will not be logged during a recording session. The following example shows that only GPS NMEA sentences starting with GPGGA and GPRMC will be logged.

```
==== NMEA Sentence Filter ====

*[0] GPGGA - GPS Solution
 [1] GPGSA - DOP and Active Satellites
 [2] GPGSV - Satellites in View
*[3] GPRMC - Recommended Minimum GPS
 [4] GPBOD - Bearing, Origin to Destination
 [5] GPGLL - Geographic Position, Latitude, Longitude
 [6] GPRTE - Routes
 [7] GPVTG - Track and Ground Speed
 [8] GPZDA - UTC Date and Time
 [9] GPRMB - Recommended Minimum Navigation Information
 [E] PQNQR - QinetiQ HSGPS Command Response
 [F] PQNQI - QinetiQ HSGPS Miscellaneous Information
 [G] PQNQP - QinetiQ HSGPS Extended Position
 [H] PQNQV - QinetiQ HSGPS Extended Satellites in View
 [I] PQNQT - QinetiQ HSGPS Time and date
 [J] PRWIZCH - NAVMAN Jupiter specific
 <Esc>
?
```

If you select all of the sentence names in the list (all items appear with a '*') then only these sentences selected will be recorded, ALL OTHERS WITH OTHER NAMES ARE NOT LOGGED. If you need to record all incoming data, return to the 'Recording Options' menu and select <A>. If you want to filter NMEA sentences again, select the <N> item from the 'Recording Options' menu once more and the sentences you previously selected will still be remembered.

8.3.3 Sub Sampling ASCII Line Data

If your source data is formatted as ASCII text lines (e.g. NMEA, equipment sensor data, etc.) it is possible to write a sub sampled selection of this data to the flash store to help reduce the overall storage requirements and to reduce data upload times. AntiLog supports a simple, but powerful method of selecting sub sampled data. Selecting [S] from the 'Recording Options' menu brings up the following sub menu.

```
==== ASCII Line Sub Sample Filter Options ====

 <S> First line of frame starts with:
 <N> Record 1 in every: {2} frames
 <Esc>
?
```

When AntiLog is in record mode with the sub sample filter selected, it looks for an ASCII text line starting with the characters specified (case sensitive). No data is recorded during this process. The line detected and any following data lines are then recorded until this line is found again in the source data. At this point, data recorded is disabled until the line is found again. If this is the 'Nth' time this data line has been detected, data recording will be enabled again, and so on. in this way, sub sampled frames of text line data are recorded.

Select the <S> item in the 'ASCII Line Sub Sample Filter Options' menu allow data entry of the first few characters of the first line you want sub sampled in the data (in the example above, $GPGGA has been entered). As you enter new characters, they will be echoed to the terminal. Type the RETURN key to accept these changes or the Escape key to cancel data entry and restore the previous value. If you want to delete the last character typed, use the keyboard BACKSPACE key (or on some keyboards, the DEL key) and the current entry will be re-written to the terminal on the next line. The first line string pattern is limited to a maximum of 25 characters. If an empty string is entered, the sub sampling system will match all text lines regardless of content.

Select the <N> item in the 'ASCII Line Sub Sample Filter Options' menu to enter the frame selection rate. The menu system prompts for a new value below the sub menu. Enter a number in the range 2 to 99999999. Use a backspace (or on some keyboards, the DEL key) to delete the last digit typed. The frame periods are automatically restricted to the range 2 to 99999999 when the RETURN key is used to confirm a new entry. Use the Escape key to cancel data entry and restore the previous value. The previous value is also restored if RETURN is typed with no digits entered.

The following example demonstrates the sub sampling of a NMEA data source for the following Sub Sample filter options:-

```
==== ASCII Line Sub Sample Filter Options ====

 <S> First line of frame starts with: $
 <N> Record 1 in every: 3 frames
 <Esc>
?
```

Event	Source Data	Sub Sample Logic: N = 3, Start=$
Recording Started->	$GPGSV,3,3,11,16,.....	<- First line Match '$', start logging
	$GPRMC,173840,A,5.....	<- Line match 1, stop logging
	$PRWIZCH,13,7,10,.....	<- Line match 2, stop logging
Second logged Frame->	$GPGGA,173841,511.....	<- Line match 3, start logging
	$GPGSA,A,3,13,10,.....	<- Line match 1, stop logging
	$GPRMC,173841,A,5.....	<- Line match 2, stop logging
Third logged Frame->	$PRWIZCH,13,7,10,.....	<- Line match 3, start logging
	$GPGGA,173842,511.....	<- Line match 1, stop logging
	$GPGSA,A,3,13,10,.....	<- Line match 2, stop logging
Forth logged Frame->	$GPGSV,3,1,11,13,.....	<- Line match 3, start logging
	$GPGSV,3,2,11,01,.....	<- Line match 1, stop logging
	$GPGSV,3,3,11,16,.....	<- Line match 2, stop logging
Fifth logged Frame->	$GPRMC,173842,A,5.....	<- Line match 3, start logging
	$PRWIZCH,13,7,10,.....	<- Line match 1, stop logging
	$GPGGA,173843,511.....	<- Line match 2, stop logging
Sixth logged Frame->	$GPGSA,A,3,13,10,.....	<- Line match 3, start logging
	$GPRMC,173843,A,5.....	<- Line match 1, stop logging
	$PRWIZCH,13,7,10,.....	<- Line match 2, stop logging
Seventh logged Frame->	$GPGGA,173844,511.....	<- Line match 1, stop logging
	$GPGSA,A,3,13,10,.....	<- Line match 2, stop logging
	$GPGSV,3,1,11,13,.....	<- Line match 3, start logging
Eighth logged Frame->	$GPGSV,3,2,11,01,.....	<- Line match 1, stop logging
	$GPGSV,3,3,11,16,.....	<- Line match 2, stop logging
	$GPRMC,173844,A,5.....	<- Line match 3, start logging
Ninth logged Frame->	$PRWIZCH,13,7,10,.....	<- Line match 1, stop logging
	$GPGGA,173845,511.....	<- Line match 2, stop logging
	$GPGSA,A,3,13,10,.....	<- Line match 3, start logging
	.....	

The next example demonstrates the sub sampling of the same NMEA data source but using a specific start line string shown in the following Sub Sample filter options:-

```
==== ASCII Line Sub Sample Filter Options ====
```

```
 <S> First line of frame starts with: $GPGGA
 <N> Record 1 in every: 3 frames
 <Esc>
?
```

Event	Source Data	Sub Sample Logic: N = 3, Start=$GPGGA
Recording Started->	$GPGSV,3,3,11,16,.....	<- Line ignored
	$GPRMC,173840,A,5.....	<- Line ignored
	$PRWIZCH,13,7,10,.....	<- Line ignored
First logged Frame->	$GPGGA,173841,511.....	<- First line Match, start logging
	$GPGSA,A,3,13,10,.....	
	$GPRMC,173841,A,5.....	
	$PRWIZCH,13,7,10,.....	
	$GPGGA,173842,511.....	<- Line match 1, stop logging
	$GPGSA,A,3,13,10,.....	
	$GPGSV,3,1,11,13,.....	
	$GPGSV,3,2,11,01,.....	
	$GPGSV,3,3,11,16,.....	
	$GPRMC,173842,A,5.....	
	$PRWIZCH,13,7,10,.....	
	$GPGGA,173843,511.....	<- Line match 2, stop logging
	$GPGSA,A,3,13,10,.....	
	$GPRMC,173843,A,5.....	
	$PRWIZCH,13,7,10,.....	
Second logged Frame->	$GPGGA,173844,511.....	<- Line match 3, start logging
	$GPGSA,A,3,13,10,.....	
	$GPGSV,3,1,11,13,.....	
	$GPGSV,3,2,11,01,.....	
	$GPGSV,3,3,11,16,.....	
	$GPRMC,173844,A,5.....	
	$PRWIZCH,13,7,10,.....	
	$GPGGA,173845,511.....	<- Line match 1, stop logging
	$GPGSA,A,3,13,10,.....	
	.....	

8.3.4 No log method

There are times when you need to capture events, digital bit state, button pushes, and the like and write them into a log file for a channel but you are not interested in any RS232 data presented at that channel's RS232 input. For example, if you were to use the secondary serial port connection to log the digital bit state of an external signal line, each time it transitioned, you may also get a random looking RS232 character presented at the input channel which would be of no value.

Characters such as this at the input would also prevent the ASCII line insertion mechanism from working as the system waits for a clean 'end of ASCII line' sequence before it can insert more events into a channel's log file. Logging a few random characters will block this event insertion mechanism and will therefore completely block further digital event storage.

Note that selecting this recording method does not prevent the sending of user commands either from button pushes or from the polling mechanism. It is therefore safe to use this option if you are only using a channel to define user commands and are not interested in any data presented to that channel's RS232 input.

8.4 Time Stamping Recorded Data

AntiLog can automatically time stamp incoming data and embed this information in the recorded data for each recording channel. You are then able to optionally expand this date and time information later when you play back the data. AntiLog uses its own clock reference for the time stamping (See section 6.7).

AntiLog uses efficient data compression to ensure embedded date and time stamps do not require excessive storage. For example, although the date and time stamp when played back

in ASCII is up to 25 bytes long (depending on the chosen output format), the actual overhead in storing date and time for ASCII line time stamping is only an extra six bytes giving a full date and time resolution to 1mS.

As an example, if you have the 'Record all data' item selected in the 'Recording Options' menu, then entering a <T> at this menu will bring up the 'Time Stamping options for Record' menu as follows:-

```
==== Record Time Stamping Options ====

*[D] Disable time stamping
 [A] ASCII line time stamping (ASCII line data, e.g. GPS NMEA)
 [8] ASCII 8 bit line time stamping (line data is 8 bit)
 <N> Insert time stamp before every {1} binary byte
 : :
*[E] Add explicit date and time text to inserted $EVENT messages
 <Esc>
?
```

Use the [D] item to disable time stamping for this channel. Not all of the options in the Time Stamping menu will always be available depending on the recording mode. For example, if the 'Record filtered GPS NMEA' item is selected in the 'Recording Options' menu, the 'N' byte time stamping item will not be present.

8.4.1 ASCII line time stamping

Use the [A] item to select ASCII line time stamping. A time stamp will be inserted at the start of each ASCII line. This is ideal for GPS NMEA sentences and power meter readings for example. In this mode, the top bit in each eight bit character received is cleared before being written to the FLASH store and so this mode is not suited to binary data recording but does consume the least amount of data storage on the FLASH media.

8.4.2 ASCII 8 bit line time stamping

Use the [8] option to time stamp ASCII line data where full eight bit recording is required (e.g. line data may have characters above decimal value 127).

8.4.3 'N' byte binary time stamping

If you are recording pure binary data (Record All), you may wish to select 'N' byte time stamping. Without knowing the format of the data itself, it would not normally be possible to time stamp binary data. However, in this mode, a time stamp is recorded ahead of every 'N' bytes of incoming data. The time stamp refers to the time the first byte in a block of 'N' bytes was received. The time stamp information can be expanded in the playback data or not output at all. The time stamp can also be used to assist with real time playback. Using this time stamping method allows full binary data capture but with the addition of embedded timing information.

It is possible to set N to 1, so a time stamp exists for every byte recorded in a session. This increases the FLASH media file size by a factor of 7 but this feature can be extremely valuable for debugging system output. Selecting <N> in the 'Time Stamping Options for Record' menu prompts for a value for 'N' which must be in the range 1 to 65535:-

```
Enter number of bytes to follow each time stamp (1 to 65535): 5
```

Enter a number followed by the Enter or Return key on your terminal keyboard.

```
==== Record Time Stamping Options ====

 [D] Disable time stamping
 [A] ASCII line time stamping (ASCII line data, e.g. GPS NMEA)
 [B] Binary line time stamping (line data is 8 bit)
*<N> Insert time stamp before every {5} binary bytes
 : :
*[E] Add explicit date and time text to inserted $EVENT messages
 <Esc>
?
```

When you play back data recorded in a session with 'N' byte time stamping, the session header contains the 'N' value to help with data post processing.

8.4.4 Specifying date and time for $EVENT message

When you request event logging (for example, button events, see section 8.6), the `$EVENT` messages written to a channel log file by default contain a date and time field. The date and time are stored in ASCII rather than a compressed binary format. You therefore have the option to turn off date and time output in `$EVENT` messages to reduce storage requirements if you are recording high volumes of events.

If you record with time stamping enabled, the `$EVENT` messages will be time stamped anyway, so you may not need date and time added to the ASCII `$EVENT` messages. A '*' character to the left of the `[E]` item in the Time Stamping Options for Record menu means date and time will be added to ASCII `$EVENT` message written to the channel log file.

8.5 Defining the End Of Line Character

When reading in lines of ASCII data, AntiLog needs to know when a complete ASCII line has been read in. ASCII text lines generally end in carriage return (<CR>) followed by line feed (<LF>), carriage return only or line feed only.

```
==== ASCII End Of Line Character Selection ====

 [R] ASCII Return (<CR>, 13 dec, 015 oct, 0x0d hex)
 [L] ASCII Line Feed (<CR><LF> or <LF>, 10 dec, 012 oct, 0x0a hex)
 <U> User defined
 : :
*[A] Auto detect (<CR>, <LF> or <CR><LF>)
 <Esc>
?
```

If you leave Auto Detect selected (`[A]`), AntiLog will attempt to determine the end of line sequence itself based on the assumption that lines will end in either <CR>, <LF> or <CR><LF>. If you know what the line termination character is, select it here and AntiLog will not have to perform a search for possible end of line combinations. The advantage in telling AntiLog in advance what the end of a line will be is that the auto detect mechanism can never be 100% reliable in every situation (because of possible data corruption for example). However, for most users, the auto detect end of line feature will perform well in nearly all situations.

V5.1 allows you to define the end of line character. This can be any single character in the value range 0 to 255 so it is possible in some circumstances to use this feature for time stamping binary data. In the example that follows, a character value of 35 (the '#' character) has been entered to represent the character used at the end of incoming data lines from a custom data source. Select the <U> item to enter a line character value:-

```
Enter end of line character value (in decimal): 35

==== ASCII End Of Line Character Selection ====

 [R] ASCII Return (<CR>, 13 dec, 015 oct, 0x0d hex)
 [L] ASCII Line Feed (<CR><LF> or <LF>, 10 dec, 012 oct, 0x0a hex)
*<U> User defined (35 dec, 0x23 hex)
 : :
 [A] Auto detect (<CR>, <LF> or <CR><LF>)
 <Esc>
?
```

8.6 Defining the 'On' and 'Off' button functions for record

The <1> and <2> items in the 'Recording Options' menu define the responses to the 'On' and 'Off' buttons during record. If there is a '*' character to the left of these items, this indicates that a button has been configured to perform an action during record.

If you select the <1> item from the 'Recording Options' menu then the following sub-menu will appear for the 'On' button:-

```
==== Define 'On' Button Actions During Record ====

*[N] Button performs no action
 [E] Button sends event to log file
 [D] Button sends digital bit state to log file
 <U> Button transmits user command
 : :
 <B> Go to the 'Off' button menu
 <Esc>
?
```

If 'Dual channel data logging' is enabled in the 'Recording Options' menu, then this menu will be extended as follows to allow the output serial port to be changed. Use the [G] item to toggle between the settings for the other recording channel.

```
==== Define 'On' Button Actions During Record for Channel 1 ====

*[N] Button performs no action
 [E] Button sends event to log file on this channel
 [D] Button sends digital bit state to log file on this channel
 <U> Button transmits user command
 --- Transmit user command to channel serial port {M:4800,8,N,1,-)
 --- Transmit user command to other serial port   {S:4800,8,N,1,-)
 : :
 <B> Go to the 'Off' button menu
 [G] Go to the other channel
 <Esc>
?
```

Select the [N] item to ensure the button performs no function during record. Note that if you are making selections for the 'Off' button, the act of pressing and holding the Off button will always shut down your unit regardless of any action settings in this type of menu.

8.6.1 Logging button events

If the [E] item is enabled, then the assigned button push insert an event into the logged data stream during record mode for the selected channel. An event is packed into an ASCII string which looks like a NMEA sentence. The format of an event written to the flash store is as follows (format depends on whether the 'Add explicit date and time text to inserted $EVENT messages' item is enabled in the 'Record Time Stamping Options' menu):-

```
$EVENT,button,number*csum<CR><LF>
$EVENT,button,number,f,date,time*csum<CR><LF>
```

Where:

`button` = Button type, either ON or OFF
`number` = Sequential button event number.
`f` = Date and Time flag. 'V' for Valid date and time, 'R' for relative date and time.
`date` = Date string. Format defined in the 'System Time and Date Options' menu.
`time` = Time string as HH:MM:SS.sss
`csum` = NMEA compatible EXOR checksum

The button field will be either ON or OFF depending on which button was pressed. The number is a sequence number which increments from zero every time a button is pushed. There are two button counters maintained inside AntiLog, one for 'On' button pushes and one for 'Off' button pushes. Therefore pushing the 'On' button will not effect the sequence number for the 'Off' button. An example showing the fourth time the 'On' button has been pushed is shown here:-

```
$EVENT,ON,3,V,03-Apr-2008,12:34:56.352*4D<CR><LF>
```

8.6.2 Logging Digital Bit State on a button push

If the [D] item is enabled, then the current state of selected digital I/O lines is written to the log file as an inserted event when the appropriate button is pressed. See section 6.11 for more details on digital bit state logging.

8.6.3 Sending User Commands on a button push

Select the <U> item to attach user commands to the buttons for transmission during record. When configured, every time you push the selected button in record mode, the connected user command is transmitted at the user equipment. This is useful if you need to send initialisation commands to your equipment or mode the equipment mid way through a trial. For example, you could attach 'power up' and 'power down' type commands to the AntiLog 'On' and 'Off' buttons to control the user equipment power during a trial.

When you select the <U> item from the button actions menu for the 'On' button, the following sub-menu will appear:-

```
==== Select User Equipment Command for 'On' button: Channel 1 ====
 (User command 1 can contain up to 255 bytes, others up to 64 bytes each)

*[0] No selection
 : :
 [1] User command 1. No assignments
     ASC: HELLO<CR><LF>
 [2] User command 2. No assignments
     (empty)
 [3] User command 3. No assignments
     (empty)
 [4] User command 4. No assignments
     (empty)
 : :
 --- Define selected user command
 --- Modify selected user command using hexadecimal data entry
 --- Show selected user command content
 : :
 <B> Go to the 'Off' button menu
 [G] Go to the other channel
 <Esc>
?
```

If you would like user command 1 to be assigned to your 'On' button, type a '1' to select User Command 1.

```
==== Select User Equipment Command for 'On' button: Channel 1 ====
 (User command 1 can contain up to 255 bytes, others up to 64 bytes each)

 [0] No selection
 : :
*[1] User command 1. Assigned to: 'On'[Ch1]
     ASC: HELLO<CR><LF>
 [2] User command 2. No assignments
     (empty)
 [3] User command 3. No assignments
     (empty)
 [4] User command 4. No assignments
     (empty)
 : :
 <D> Define selected user command
 <M> Modify selected user command using hexadecimal data entry
 [S] Show selected user command content
 : :
 <B> Go to the 'Off' button menu
 [G] Go to the other channel
 <Esc>
?
```

If there is no content in the selected User Command definition, or you need to change the existing content, you can use the <D> or <M> items in this menu to enter a new user commands. Full details on how to enter user commands are given in section 8.9 but as an example, you can select the <D> item, enter the command you need using the terminal input and confirm the input entry by pressing the 'On' button. Now, every time you press the 'On' button during record, the selected user command will be transmitted on the channel 1 assigned serial port.

8.7 User Equipment Commands and Polling Functions

For each recording channel you can transmit a selected user command at a defined repeat period. This feature is ideal if you need to poll equipment for readings. For example, if you

are recording data from a power meter, you may need to repeatedly send a command to return readings to record.

Select the <U> item in the 'Recording Options' menu to define how polling and user commands are handled in a channel. An example of selecting the menu for channel 1 follows:-

```
==== User Equipment Commands and Polling Functions for Channel 1 ====

 <U> User equipment command selection {None selected}
 [E] Enable polling of digital bit state to log file
 : :
 --- Define polling repeat period for this channel {1 sec}
 --- Define initial polling delay for this channel {0 mS}
 : :
 --- Transmit user command to channel serial port {M:4800,8,N,1,-}
 --- Transmit user command to other serial port   {S:4800,8,N,1,-}
 : :
 [G] Go to the other channel
 <Esc>
?
```

If you need to send a user command you will need to select one using the 'User equipment command selection' item. Full details on how to enter user commands are given in section 8.9.

8.7.1 Defining the polling period

If you select either a user command or you enable digital bit state logging, then you can define the polling repeat interval (in milliseconds) for these selections. The text to the right of the polling and polling delay items show the current settings. When you select the <P> itemfor example, the following text appears:-

```
Enter new user command repeat period
Range: 50 to 1209600000 mS (50 mS to 14 days), 0=Send once only.
Time units can be used (any order): n DAYS n HOURS n MINS n SECS n MS
Example specifying 155600mS:  2 mins 35 secs 600

Repeat period (mS):
```

Enter a new value in the range 50 to 1209600000 (a range of 50mS to two weeks). If you enter a value of zero then the user command will be transmitted just once at the start of a log session.

You can specify the time with any combination of units as described by the prompt. So you could enter:-

```
Repeat period (mS): 1 day 30 mins 20 secs
```

8.7.2 Logging Digital Bit State at the polling rate

If you toggle the [E] item in the Polled User Equipment Commands and functions menu until there is a '*' character to the left if it, then you can record the digital bit state to the channel log file at the defined polling rate. You do not have to select a User Command as well to do this.

However, the rate is shared between the functions so it is not possible to save the digital bit state at a different rate to the polled user command output for a given channel.

If you do need to poll the digital bit state at the same time as outputting User Commands, but at a different rate, try recording in dual channel mode and using the other channels polling function to define a different rate.

8.8 User Equipment Command Selection

This menu is used to select a user command to output at the repeat rate defined in the 'User Equipment Commands and Polling Functions' menu. You can select, define or redefine a definition and you also get an overview of the other user command assignments to ensure your changes here do not effect other user command operation, such as for existing assignment to 'On' or 'Off' button pushes. The following is an example where no User Command is assigned for polling.

```
==== Polled User Equipment Command Selection for Channel 1 ====
 (User command 1 can contain up to 255 bytes, others up to 64 bytes each)

*[0] No selection
 : :
 [1] User command 1. No assignments
     ASC: HELLO<CR><LF>
 [2] User command 2. No assignments
     (empty)
 [3] User command 3. No assignments
     (empty)
 [4] User command 4. No assignments
     (empty)
 : :
 --- Define selected user command
 --- Modify selected user command using hexadecimal data entry
 --- Show selected user command content
 : :
 [G] Go to the other channel
 <Esc>
?
```

In the preceding example, the first user command definition already has the characters “HELLO” followed by carriage return and line feed assigned. To set this user command for output polling, select `[1]`. The menu system changes to reflect your selection and you will now see that user command 1 is assigned to polling:-

```
==== Polled User Equipment Command Selection for Channel 1 ====
 (User command 1 can contain up to 255 bytes, others up to 64 bytes each)

 [0] No selection
 : :
*[1] User command 1. Assigned to: Polling[Ch1]
     ASC: HELLO<CR><LF>
 [2] User command 2. No assignments
     (empty)
 [3] User command 3. No assignments
     (empty)
 [4] User command 4. No assignments
     (empty)
 : :
 <D> Define selected user command
 <M> Modify selected user command using hexadecimal data entry
 [S] Show selected user command content
```

```
 : :
 [G] Go to the other channel
 <Esc>
?
```

8.9 User Equipment Command Management

AntiLog can store up to four user equipment commands which can be assigned for output on any channel. The first user equipment command can be up to 255 bytes in length but the other three can only contain up to 64 bytes each.

For each recording channel, any user equipment command can be assigned to the 'On' and 'Off' buttons and they can be assigned to the channel's own output polling mechanism which means a command can be transmitted repeatedly at a user defined rate for a given channel.

The selection of user commands is independent for each recording channel but unlike nearly all other options, the actual user equipment command definitions are shared across the two channels which means that if you make a change to a user equipment command definition, it may effect both channels if the definition is in use by both channels.

To help with this situation, all user command definition menus show all assignments for both channels for all available user commands.

8.9.1 Defining User Equipment Commands

The following example assumes you want to define a user command for polled output but the same techniques apply for defining user command assignments for the 'On' and 'Off' buttons for example.

```
==== Polled User Equipment Command Selection for Channel 1 ====
 (User command 1 can contain up to 255 bytes, others up to 64 bytes each)

 [0] No selection
 : :
*[1] User command 1. Assigned to: Polling[Ch1]
      (empty)
 [2] User command 2. No assignments
      (empty)
 [3] User command 3. No assignments
      (empty)
 [4] User command 4. No assignments
      (empty)
 : :
 <D> Define selected user command
 <M> Modify selected user command using hexadecimal data entry
 [S] Show selected user command content
 <Esc>
?
```

Select one of the user equipment commands by typing '1' to '4', then either select the <D> or <M> items to define the content of the selected user command. In the example, we are about to define user command 1.

If you select the <D> item, the following prompt appears

```
Enter user equipment command.
'On' button to accept, 'Off' button to cancel.
```

Now send down any command sequence you require from your host device at the current menu baud rate. If you have application software that would normally control your equipment, you may wish to use that at this point and capture the command output. You must then use the AntiLog 'On' and 'Off' buttons with this menu option to terminate input because it is designed to accept real equipment commands which can be binary in nature. Typing the Return or Enter key in during this mode would simply enter an ASCII return key code into the user command definition rather than terminate user input. Similarly, typing the Escape key will not cancel the current user input, it will enter an Escape ASCII character into the current user command. Hence to accept any entered user command when input is complete, press the 'On' button. To reject any new user command input and restore the current user command, press the 'Off' button.

You can dump the captured command to the terminal as a hexadecimal and ASCII string using the [S] item to ensure you have exactly what you expect as the user command.

As an example, you could enter HELLO followed by the enter key on your terminal keyboard and depending on how your terminal program handles sending of end of line characters, you may end up with an entry similar to this for user command 1:-

```
 : :
*[1] User command 1. Assigned to: Polling[Ch1]
     ASC: HELLO<CR><LF>
```

The Polling [CH1] text shows you this definition is assigned to the polling function for channel 1.

8.9.2 Defining User Equipment Commands as hexadecimal

If you would like to enter a user command as a series of hexadecimal values (with an optional initial position offset), then select the <M> item in the User Equipment Command Management menu. This method is an ideal way to enter complex equipment commands that may contain binary values.

As an example, if we wanted to set user command 1 to HELLO then we would select the <M> item in the 'User Equipment Command Management' menu with User Command 1 selected and enter the following:-

```
==== User Equipment Command 1 Hexadecimal Data Entry ====

 00: <empty>

 Data entry format  xx xx xx xx......
 Data entry format  oo: xx xx xx xx......
 Where oo = Hexadecimal position offset, xx = Hexadecimal byte values.
 : :
 [Z] Clear command (set to zero length)
 [-] Reduce length by one (remove last)
 <Esc> Escape key to terminate data entry
?  Data Entry: 48 45 4C 4C 4F
```

This data entry would give the following result when the Enter or Return key is pressed as we have entered the hexadecimal equivalent of “HELLO” into the user command. Note the hexadecimal values are shown in a column on the left together with their position offset and

the equivalent printable ASCII characters are shown in a column on the right when the menu is refreshed.

```
[Setting user command: Please wait...complete]

==== User Equipment Command 1 Hexadecimal Data Entry ====

 00: 48 45 4C 4C 4F                                    HELLO

 Data entry format  xx xx xx xx......
 Data entry format  oo: xx xx xx xx......
 Where oo = Hexadecimal position offset, xx = Hexadecimal byte values.
 : :
 [Z] Clear command (set to zero length)
 [-] Reduce length by one (remove last)
 <Esc> Escape key to terminate data entry
?  Data Entry:
```

You can use the Hexadecimal data entry menu to edit an existing command by specifying a position offset (which defaults to zero if not specified) and new values for those locations. For example, entering `02: 58 58` would set the two 'L' characters in HELLO to 'X' giving:-

```
[Setting user command: Please wait...complete]

==== User Equipment Command 1 Hexadecimal Data Entry ====

 00: 48 45 58 58 4F                                    HEXXO

 Data entry format  xx xx xx xx......
 Data entry format  oo: xx xx xx xx......
 Where oo = Hexadecimal position offset, xx = Hexadecimal byte values.
 : :
 [Z] Clear command (set to zero length)
 [-] Reduce length by one (remove last)
 <Esc> Escape key to terminate data entry
?  Data Entry:
```

If you specify a position offset greater than the number of bytes already defined in the current command definition then the menu system will fill the gaps with the last byte value in the current definition (or zero if the current command is empty). Using the HEXXO example above, entering `0A: 21` would request that the eleventh byte be set to ASCII '`!`' but filled to that position with the last existing character (which is '`O`') to give:-

```
 00: 48 45 58 58 4F 4F 4F 4F 4F 4F 21                  HEXXOOOOOO!
```

Any data specified beyond the maximum length allowed for a given User Equipment Command will be ignored.

8.9.3 Viewing the current user command definition

You can show the current user command on the terminal screen by selecting the `<S>` item at the 'User Equipment Command Options' menu. The current command will be listed both as a hexadecimal dump and as ASCII listing to the screen. Each line shows 16 bytes and non-printable characters shown in the ASCII area on the right will be shown as a '.' character.

If the following is entered as the user command:-

```
$PQNQS,RSET,RSET111111<CR><LF>
```

Then showing the user command will display the following to the menu terminal:-

```
00: 24 50 51 4E 51 53 2C 52 53 45 54 2C 52 53 45 54  $PQNQS,RSET,RSET
10: 31 31 31 31 31 31 0D 0A -- -- -- -- -- -- -- --  111111..
```

Note that the first two characters in the above lines (followed by ':') are the hexadecimal index into the command so that a visual check can be made to ensure longer command sequences are the correct length and characters and bytes appear where expected.

8.10 Media Writing Options

The AntiLogPro hardware supports a ring buffer storage method. In normal operation, collected data is written to the FLASH media store unit until it is full and then logging stops. This is important for critical data collection because with this storage method, no previously recorded data can ever get overwritten, so for example, accidentally switching a unit on and filling it up will never overwrite what has already been recorded on a unit. The only way to delete previously recorded data in this case is to actively delete it either using the menu system or optionally using a special 'On' and 'Off' button held sequence during power up (this procedure is described in section 6.6).

With AntiLogPro, you can alternatively select a new ring buffer storage method. You define the total storage space you would like to use for a media ring buffer and AntiLog will maintain the most recent data but will overwrite (discard) the oldest so that the total collected data still fits into the allocated media space. This storage method is ideal when you want to capture an event from your equipment which may only occur vary rarely. Instead of using a very large media storage option to record everything so you can capture the event, you can select the ring buffer storage method with a suitable ring size to ensure you capture the event and then if the event is detected, you have a record of the logged data leading up to the event without having to download and process very large quantities of data.

A “Media write options” item in the 'Recording Options' menu for AntiLogPro allows you to select the media writing method for a given task and it shows which method is currently active.

```
    <W> Media write options {Normal logging}
```

Select <W> item to open the 'Media Write Options' menu allows to select the normal logging method, or a ring buffer method. The following example shows the ring buffer storage method selected which uses all of the available space on the FLASH media.

```
==== Media Write Options ====

 [N] Normal logging mode.  Store data up to media capacity and stop
*[R] Ring buffer mode.  Store the latest data, discard the oldest
 : :
*[M] Use maximum media storage space available for ring buffer
 <U> User defined maximum ring buffer storage space
 <Esc>
?
```

8.10.1 Ring buffer store

If you application requires the ring buffer storage method, you can allocate all of the space available on any inserted media card as the ring buffer or you can define your own total ring buffer size instead. The total storage size you define is held in the AntiLog non-volatile settings store, not on the media itself so you can use media cards with different capacities knowing you have the same settings for each recording session. If you have defined a ring buffer size which is higher than the current inserted media size then the maximum size available on the inserted media will be used instead.

To enter your own total ring buffer storage size, select the <U> item from the 'Media Write Options' menu and you will be prompted to enter a value in Mbytes.

```
Enter the total storage size to use for a new ring buffer in MBytes.
Range 1 to 4096. (Available size on inserted media is 983MB):
```

Please note that if a media card has already been used for ring buffer storage and you are about to append some data to the store then the size already allocated on the card is used to add another session. If you need the AntiLog unit settings applied instead then you will need to use the 'Erase all recorded data' item in the 'Recording Options' menu to start a new ring buffer with your desired settings.

Internally, AntiLog uses a special block overwrite algorithm to implement the ring buffer. When you define the amount of media to be used for the ring buffer, AntiLog divides this space into four blocks. Data is written into these blocks in turn until the maximum capacity defined by the ring buffer size is exceeded. At this point, AntiLog will delete and overwrite data that appears in the first allocated block, then the second, third, etc. In this way, AntiLog will always have at least three out of the four blocks of recorded data available for replay. As an example, if you define the total ring buffer media size to be 4MByte, then at least 3MByte or more of data will be available for replay when you have recorded 3 or more MByte of data.

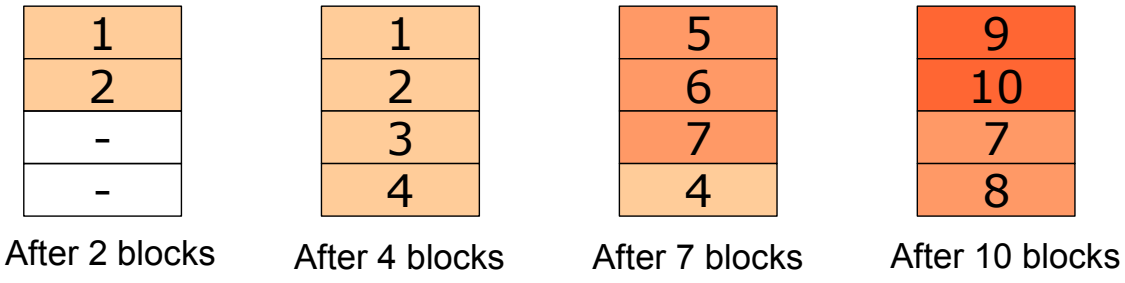


Figure 12: Ring buffer block filling during record

The major advantage to this block overwrite ring buffer method is that you can record data as you normally would including support for multiple sessions, time stamping, sessions with completely different settings, etc. The disadvantage is that some space (i.e. the empty part of the block that is being written to) is not available at all times so you can only guarantee the storage capacity of three out of the four ring blocks at any one instant.

There are no options to select for playing back data from a ring buffer store. Playback is completely automatic from a normal store or ring buffer store and data will always appear in the order it was recorded.

8.11 Event input logging

V5.1 can insert event messages into your recorded data stream whenever a logic level transition occurs on a dedicated 'EventIn' digital input line. The 'EventIn' digital input line is available as a CMOS 3.3V logic input on the header of the original AntiLog OEM hardware or as a protected digital input on all AntiLogPro hardware revisions. Event input logging is not possible with the original boxed AntiLog hardware as the 'EventIn' line is not accessible and so in this case, the “Event logging options” item is not available in the 'Recording Options' menu.

Product	Logic 1	Logic 0	Protection	Pull-up	Impedance	Connection
AntiLog OEM	>2.0V	<1.0V	0.0 to +3.3V	100k	100k	Header J3 pin 9
AntiLogPro	>2.0V	<1.0V	-40.0 to +40.0V	-	90k	9-Way D, pin 9
AntiLogPro OEM	>2.0V	<1.0V	-40.0 to +40.0V	-	90k	Header J3 pin 17

The original AntiLog OEM 'EventIn' hardware line can be left open circuit to float high or actively driven high to give a logic '1' or it can be pulled down to ground (via a switch for example) or driven low to give a logic '0'. Do not apply voltages to this pin outside the normal CMOS 3.3V logic levels (0.0V to 3.3V).

For all AntiLogPro hardware, you need to supply a logic voltage to set a logic '1' or no voltage or a low level for logic '0'. The line is protected from any input in the range -40V to +40V.

You can set up Event logging for any data recording channel (or both if required) but the selection for the edge triggering method will always be common to both channels so it is not possible to log negative edge transitions for channel 1 and positive edge transitions for channel 2.

```
==== Event Logging Options for 'EventIn' Digital Input for Channel 1 ====

 [D] Disable 'EventIn' event logging for this channel
*[I] Insert 'EventIn' messages in the log file for this channel
 : :
 [N] Events triggered by Negative edge transitions (applies to BOTH channels)
*[P] Events triggered by Positive edge transitions (applies to BOTH channels)
 : :
 [G] Go to the other channel
 [+] Copy these options to the other channel
 <Esc>
?
```

Events are inserted into a channel log file as ASCII NMEA compatible data lines (complete with a NMEA compatible checksum at the end). The format of the event is as follows (format depends on whether the 'Add explicit date and time text to inserted $EVENT messages' item is enabled in the 'Record Time Stamping Options' menu):-

```
$EVENT,EVI,pinID,polarity*csum
$EVENT,EVI,pinID,polarity,f,date,time*csum
```

Where:

`pinID` = '0'=EventIn pin (no other pins supported yet)
`polarity` = '0'=Negative edge detected, '1'=Positive edge detected.
`f` = Date and Time flag. 'V' for valid date and time, 'R' for relative date and time.
`date` = Date string. Format defined in the 'System Time and Date Options' menu.

`time` = Time string as HH:MM:SS.sss
`csum` = NMEA compatible EXOR checksum

Events will ONLY be inserted into the log file following a correctly terminated ASCII line from the channel's data source (e.g. from ASCII NMEA data from a GPS receiver). If a data source is connected to a channel input that is not ASCII line in nature then the insertion process will not work and so you will need to select the "Do no log incoming data" item in the "Recording Method" menu item in "Recording Options".

8.12 Controlling Front Panel LEDs for Record

Select the `<L>` item in the 'Recording Options' menu to toggle the state of the LEDs during record mode. You might need this function if you are working in a dark room environment or you would prefer no visual distractions during a trial.

If a star character (`*`) appears to the left of the item, the LEDs will be active during recording. If you want to run for as long as possible from a battery supply then disabling the flashing LEDs will help to conserve energy slightly to extend battery life.

Note that if this unit is given to another operator to use, there could be confusion over whether the unit is working properly if the LEDs are disabled during record. It may look as though your AntiLog unit is not working at all in record mode.

8.13 Erasing Recorded Data

Use the '`<E> Erase all recorded data`' item in the 'Recording Options' menu to erase all data currently in the AntiLog FLASH media store. You will be prompted to confirm this action. You can also erase media contents using a special start up holding the 'Off' button down. This procedure is described in section 6.6.

If you accidentally erase your media and decide you want to 'undo' the erase operation, use the media recovery feature in the 'General Options' menu (see section 7.6).

8.14 Entering Record Mode from the Menu System

You can go straight into recording mode using the '`<R> Record data now`' menu item in the 'Recording Options' menu instead of using the 'Off' and 'On' buttons to switch modes. You will be prompted to confirm this action. If you do, AntiLog will display the message `(Recording mode)` and it will enter recording mode. It is not be possible to issue further menu commands until the unit is powered down out of record mode and then back up in the playback mode.

One advantage of starting the record mode in this way is if your AntiLog unit does not have real time clock hardware fitted. In this case, if you power your unit off and then on again in record mode then any time and date active in AntiLog will be lost. If however, you use the 'General Options' menu to define the current date and time, you can enter the record mode from the menu system without powering down the unit and hence preserving real date and time for the recording session. Note that a recording session must be terminated by pressing and holding the 'Off' button.

9. Playback Options Menu

Once data has been recorded in the flash media store in AntiLog you are able to replay the data in many ways. You are not restricted to playing back the data at the same baud rate or at the same playback rate or even the same port hardware that was specified during the recording processes. You can play back data at full rate or in 'real time'. If your hardware supports dual channel operation then you are able to playback two data channels simultaneously, again with the option of 'real time' playback on both channels.

You are also able to upload data from AntiLog V5.1 using the serial port Data Transfer protocol (ASLMTx2) while menus are active which state 'Data Transfer aware' in the text. This new upload capability supersedes the X-Modem capability offered in the AntiLog V3.x release and is much faster at higher baud rates compared to the ASLMTx protocol offered in the V4.x releases. X-Modem is not supported in V5.1 because this version supports dual channel operation and X-Modem does not.

When menus are 'On' button aware, you simply press the 'On' and 'Off' buttons to stop/start the data playback as often as you like. You are also able to embed extra information which was collected during the recording processing in the output data stream. Examples include date and time stamps and session header information. You can also playback data in a special hexadecimal dump mode for recorded data analysis.

New in V5 is the option to time shift the playback time stamps so that the time stamps reflect current playback real time clock time. For example, AntiLog can replay recorded GPS NMEA data and substitute all the date and time values so that it looks like the data is coming live from a GPS receiver, complete with recomputed NMEA line checksum values.

The Playback Options menu defines how data is replayed from the FLASH media store. The following is an example of a Playback Options menu for single channel playback. For single channel playback, you can define how the data is played back and from what recorded channel on the media. In the example, data replay will occur from data recorded as 'Channel 1'.

```
==== Playback Options ====
(Data transfer and 'On' button aware)

*[1] Playback data recorded on Channel 1
 [2] Playback data recorded on Channel 2
 --- Dual channel playback
 : :
 <P> Configure serial port {115200,8,N,1,-}
 : :
*[R] RAW playback
 [N] Real time playback: NMEA and time stamped data
 [X] Hex dump playback
 : :
 --- Real time playback options
 <T> Time stamp and channel number playback options
 [H] Embed session header in playback data
 : :
*[L] Panel LEDs enabled
 : :
 [A] Allow Escape key input to abort playback
 <S> Start playback now (or use 'On' button)
 <Esc>
?
```

The following is an example of the 'Playback Options' menu when 'Dual serial port operation' has been enabled in the 'General Options' menu and Dual channel playback has been selected:-

```
==== Playback Options ====
(Data transfer and 'On' button aware)

*[D] Dual channel playback
 : :
 <1> Configure data playback for Channel 1
 <2> Configure data playback for Channel 2
 : :
*[L] Panel LEDs enabled
 : :
 [A] Allow Escape key input to abort playback
 <S> Start playback now (or use 'On' button)
 <Esc>
?
```

In dual playback mode, both recorded channels will be played back simultaneously and you can choose the playback options you need for each playback channel. If you need 'real time' playback from both channels, make sure you select real time playback for both channels.

9.1 Serial Port Configuration for Playback

When you type <P> to configure the serial port in the 'Playback Options' menu, the following sub menu appears :-

```
==== Playback Serial Port Settings {M:115200,8,N,1,-} ====
(Data transfer and 'On' button aware)

*[1] Playback data to main serial port
 [2] Playback data to secondary serial port
 [3] Playback data to auxiliary serial port
 : :
 <B> Set serial port baud rate
 [5] 5 data bits
 [6] 6 data bits
 [7] 7 data bits
*[8] 8 data bits
 : :
*[N] No parity
 [E] Even parity
 [O] Odd parity
 [T] Two stop bits
 : :
 <I> RS232 signal line inversion
 --- RS232 Request To Send (RTS) enabled
 <S> Start playback now (or use 'On' button)
 <Esc>
?
```

1. *Auxiliary serial port item only available for AntiLogPro OEM hardware*
2. *RS232 line inversion item only available for AntiLogPro OEM and AntiLogPro boxed hardware*

Select <B> to enter the baud rate select sub menu (described later). If 'Dual channel playback' was enabled in the 'Playback Options' menu then you will not see items [1] and [2] as displayed in the example. Options [5] through to [8] select how many data bits are

generated for each character sent from AntiLog. You can also select output parity and either one stop bit or two stop bits if the 'Two stop bits' item is selected.

If the Dual Serial Port feature is enabled and the 'Playback data to main serial port' option is currently selected you can also choose to enable hardware handshaking on the main serial port RTS/CTS lines. This option is also always present in the Single Serial Port mode. Ensure the receiving hardware correctly supports RTS/CTS handshaking before using this option for playback otherwise no output from AntiLog in playback mode will be seen.

9.1.1 RS232 playback signal line inversion

AntiLogPro users have an additional sub menu item in the 'Playback Serial Port Settings' menu which allows individual RS232 line inversion to be specified.

```
==== RS232 Signal Line Inversion Options ====

*[N] Normal RS232 signal line operation
 [R] Invert Rx receive signal line logic (!R, will read CMOS/TTL RS232)
 [T] Invert Tx transmit signal line logic (!T)
 [B] Invert both Rx and Tx signal line logic (!B)
 <Esc>
?
```

RS232 line level conversion normally involves a logic inversion process and so AntiLogPro is now fully configurable to cope with all combinations of possible data inversion.

Please note that although it is possible to invert the transmit line which would then mean the logic sense is correct for CMOS RS232 transmissions, the drive level output from AntiLogPro is always at RS232 line levels which means you will see negative voltage as well as positive values output from the AntiLogPro transmit pin.

9.2 Raw Playback

When the '`[R] RAW playback`' item is selected for a channel, data is simply sent straight out of AntiLog at maximum speed for the current playback baud rate when the `[S]` option (or 'On' button) is activated. A star character (`*`) next to the `[R]` option shows this mode is active. The output stream will additionally contain session headers or time stamps if these are currently enabled.

Note that when dual channel playback is active, you may see delays in raw playback on one channel due to a real time option being selected on the other channel. Also note there may be very considerable delays to the start of any data output if you have recorded more than one session of multi channel data. For example, if you record five sessions of channel 2 data and then one session of channel 1 data, AntiLog will have to play through all of the first four sessions to get to the channel 1 data.

9.3 Real Time Playback

When '`[N] Real time playback: NMEA and time stamped data`' is selected, AntiLog will attempt to replay the selected channel data in real time as it was sent by the source equipment. It does this by using any embedded time stamps in the recording data it can find. If the data contains no embedded time stamps, AntiLog assumes it is NMEA 0183 GPS data and line output is delayed based on NMEA 0183 format content to give effective output

based on decoded time stamps embedded in the NMEA data. If no time stamps exist and the data is not NMEA then output will be at full rate.

If you have '[D] Dual channel playback' selected in the 'Playback Options' menu then you will need to select real time playback options on BOTH channels if you want to play back in real time from both channels. It is however not a requirement to play back in real time on the other channel, you will however see output on the other channel which appears not to be in time synchronization with the first channel.

You can define how your real time playback operates including specifying time shifted playback with the 'Real Time Playback Options' menu item (See section 9.5)

Note that to prevent excessive delays during playback with unusual time stamp values, there is a user configurable maximum delay (in the 'Real Time Playback Options' menu) which is used before AntiLog will resume playback of the next time stamp. This means that if there is a massive time jump in the data (e.g. A GPS receiver goes from cold start to the current time and date, you will not have to wait several years for the next NMEA sentences to be transmitted!

9.4 Hexadecimal Playback Dump

The '[X] Hex dump playback' item when selected shows the recorded channel data as a hexadecimal column dump with an ASCII listing on the right hand side. This is useful if you want to visualise recorded binary data or suspect your equipment is transmitting wrong character sequences, non printable characters, etc.

Each text line output contains a 32 bit hexadecimal index from the beginning of the current session followed by 16 hexadecimal logged data byte values and the ASCII for these values to the right of the display.

Non printable characters in the ASCII area are shown as '.' characters. As an example, the following NMEA sentences were recorded with AntiLog:-

```
$GPRMC,163402,A,5116.5228,N,00048.4485,W,14.7,149.8,270903,2.8,W,A*25
$GPRMB,A,9.99,L,,Portland,4532.300,N,12239.494,W,999.999,321.0,-15.2,V,A*64
$GPGGA,163402,5116.5228,N,00048.4485,W,1,05,2.1,85.0,M,47.9,M,,*6C
$GPGSA,A,3,,06,09,14,,,24,,30,,,,2.4,2.1,1.0*39
$GPGSV,3,1,10,04,18,053,41,06,24,197,45,09,30,128,44,14,47,270,48*74
```

The hexadecimal playback dump output for the above recorded data is shown below:-

```
00000000: 24 47 50 52 4D 43 2C 31 36 33 34 30 32 2C 41 2C  $GPRMC,163402,A,
00000010: 35 31 31 36 2E 35 32 32 38 2C 4E 2C 30 30 30 34  5116.5228,N,0004
00000020: 38 2E 34 34 38 35 2C 57 2C 31 34 2E 37 2C 31 34  8.4485,W,14.7,14
00000030: 39 2E 38 2C 32 37 30 39 30 33 2C 32 2E 38 2C 57  9.8,270903,2.8,W
00000040: 2C 41 2A 32 35 0D 0A 24 47 50 52 4D 42 2C 41 2C  ,A*25..$GPRMB,A,
00000050: 39 2E 39 39 2C 4C 2C 2C 50 6F 72 74 6C 61 6E 64  9.99,L,,Portland
00000060: 2C 34 35 33 32 2E 33 30 30 2C 4E 2C 31 32 32 33  ,4532.300,N,1223
00000070: 39 2E 34 39 34 2C 57 2C 39 39 39 2E 39 39 39 2C  9.494,W,999.999,
00000080: 33 32 31 2E 30 2C 2D 31 35 2E 32 2C 56 2C 41 2A  321.0,-15.2,V,A*
00000090: 36 34 0D 0A 24 47 50 47 47 41 2C 31 36 33 34 30  64..$GPGGA,16340
000000A0: 32 2C 35 31 31 36 2E 35 32 32 38 2C 4E 2C 30 30  2,5116.5228,N,00
000000B0: 30 34 38 2E 34 34 38 35 2C 57 2C 31 2C 30 35 2C  048.4485,W,1,05,
000000C0: 32 2E 31 2C 38 35 2E 30 2C 4D 2C 34 37 2E 39 2C  2.1,85.0,M,47.9,
000000D0: 4D 2C 2C 2A 36 43 0D 0A 24 47 50 47 53 41 2C 41  M,,*6C..$GPGSA,A
000000E0: 2C 33 2C 2C 30 36 2C 30 39 2C 31 34 2C 2C 2C 32  ,3,,06,09,14,,,2
```

```
000000F0: 34 2C 2C 33 30 2C 2C 2C 2C 32 2E 34 2C 32 2E 31  4,,30,,,,2.4,2.1
00000100: 2C 31 2E 30 2A 33 39 0D 0A 24 47 50 47 53 56 2C  ,1.0*39..$GPGSV,
00000110: 33 2C 31 2C 31 30 2C 30 34 2C 31 38 2C 30 35 33  3,1,10,04,18,053
00000120: 2C 34 31 2C 30 36 2C 32 34 2C 31 39 37 2C 34 35  ,41,06,24,197,45
00000130: 2C 30 39 2C 33 30 2C 31 32 38 2C 34 34 2C 31 34  ,09,30,128,44,14
00000140: 2C 34 37 2C 32 37 30 2C 34 38 2A 37 34 0D 0A --  ,47,270,48*74..
```

9.4.1 Hexadecimal playback with time stamps

If you enable time stamps during playback in the hexadecimal dump mode then a time stamp will appear followed by a hexadecimal block of data. This sequence repeats until the end of the media file is reached. This is especially useful when playing back binary data recorded with the 'N' byte time stamping mode. You will see a time stamp followed by the 'N' bytes of data.

9.5 Real Time Playback Options

When you have one of the real time playback modes selected, you can configure how the real time playback is handled.

```
==== Real Time Playback Options ====
(Data transfer and 'On' button aware)

 <M> Maximum playback time delay {10 secs}
 [T] Time shift playback data to the current time and date
 : :
 [E] Use primary serial input line to trigger real time playback
 --- Primary serial input line triggered on falling edge
 : :
 <S> Start playback now (or use 'On' button)
 <Esc>
?
```

9.5.1 Maximum playback time delay

You can specify a maximum playback time delay which means that although the data collection says there should be a larger time gap before the next output quantity, AntiLog will time out at this value and continue transmission anyway. This is useful in situations where there can be natural time gaps between data sets or large time jumps in GPS receiver data when signal acquisition from a cold start has occurred.

9.5.2 Time shifted playback

If you record data on a channel with time stamping enabled then you can replay the data in real time but with the time stamps replaced with the current time and date if you have this item enabled. You will see the changes if you are expanding the time stamps into the output stream or you are replaying GPS NMEA data that contains time and date values.

Time shifted playback is optimised for GPS NMEA data replay as it will actively replace occurrences of time and date in recorded NMEA 0183 sentences and recompute each line checksum value before transmission when the 'Real Time Playback' item is selected in the 'Playback Options' menu. This means you can record GPS NMEA data from one location on a given day but replay it in a lab environment as though it were coming from a live data source. In this way, you are able to implement a simple “GPS simulator” which will look like a live data source to your equipment.

9.5.3 Line triggered playback

Select the [E] item in the 'Real Time Playback Options' menu to enable Line Triggered real time playback. In this mode, whenever the playback system encounters an embedded playback time stamp (or a playback delay), it will halt data playback until it sees a rising (or falling if selected) signal edge transition on the primary serial port Rx line (port pin 2 – see section 18).

Any time value in the embedded time stamp is ignored during playback in this mode. The line triggered playback is ideal if you want to sequence information out of AntiLog from a hardware signal such as a 1 pulse per second output from a GPS receiver or a GPS simulator.

```
==== Real Time Playback Options ====
(Data transfer and 'On' button aware)

 <M> Maximum playback time delay {10 secs}
 [T] Time shift playback data to the current time and date
 : :
*[E] Use primary serial input line to trigger real time playback
 [-] Primary serial input line triggered on falling edge
 : :
 <S> Start playback now (or use 'On' button)
 <Esc>
?
```

If you are playing back data to a terminal application, typing characters will step the playback output because negative edges will be seen on the serial port Rx line. You can use this feature to step through recorded ASCII data a line at a time to help you analyse your captured data.

9.6 Session Headers

Use the [H] item in the 'Playback Options' menu if you want to output a session header at the start of each logged data session during data playback for a given channel. If enabled, this session header will appear embedded in the output data stream for the selected output channel at the start of each recorded session, even if the recorded data is in a binary format. The session header feature simplifies post processing of recorded data by allowing data processing applications to know when you started and stopped the data recording process and it also defines the serial number of the AntiLog unit used to record the session data.

The general format for a session header appearing in the output stream is as shown below:-

```
<CR><LF>$SESSION,n,f,date,time,ASL/16/nnn,nbyte*csum<CR><LF>
```

Where:

`n` = Session number 1 to 65535
`f` = Date and Time flag. 'V' for Valid date and time, 'R' for relative date and time.
`date` = Date string. Format defined in the 'System Time and Date Options' menu.
`time` = Time string as HH:MM:SS.sss
`nnn` = Product serial number of AntiLog unit used to record the data in this session.
`nbyte` = Number of bytes ('N') used in this session if 'N' byte binary time stamping was used. This item *only* appears in the session header after a comma if a session was recorded with 'N' byte binary time stamping. See section 8.4.3.
`csum` = NMEA compatible EXOR checksum

Example:

```
<CR><LF>$SESSION,1,V,05-Dec-2004,22:16:23.266,ASL/16/200*25<CR><LF>
```

If valid date and time was available when the session was created, a 'V' character will appear in the Date and Time flag field to indicate the absolute date and times given in this session are valid. If no valid date and time was available for this session, an 'R' appears in the flag parameter and this means the time and date will be relative to an assumed switch on date and time of 01-Jan-2000 00:00:00.000

9.7 Time Stamp and Channel Number Playback

Select the <T> item in the 'Playback Options' menu to set how time stamp output is to be handled per output channel. If you have recorded data with time stamping enabled, it is now possible to show the time stamps as embedded ASCII strings or messages in the output data stream. The following shows an example of the Time Stamping and Channel Number 'Playback Options' menu:-

```
==== Time Stamping and Channel Number Playback Options ====
(Data transfer and 'On' button aware)

*[T] Embed time stamps in playback data
*[I] Embed channel number in playback data
 : :
 [R] Embed time stamps and channel number as 6 byte binary
 : :
 <S> Start playback now (or use 'On' button)
 <Esc>
?
```

Note that the content of this message varies depending on other playback options selected. For example, if hexadecimal playback is set for a channel, then you are not able to expand time stamps in binary (the [R] option will not be available).

If the [T] item is enabled, any date and time stamps found in the recorded data (e.g. ASCII line date and time stamps) will be embedded into the playback data stream. If this item is not enabled, there will be no time stamp output so the output data will look exactly like the input data when the data was recorded. You are therefore able to selectively enable or disable playback of date and time stamps in recorded data depending on your data playback and processing needs. For ASCII time stamp playback, the date and time fields are comma separated so that the resulting line imports easily into a spreadsheet application, such as Microsoft Excel.

If you have chosen to play back the data in one of the real time playback modes then you can also have AntiLog replace the recorded date and time value with the current time and date. See section 9.5 for more details.

The format of the date string can be set in the 'System Time and Date Options' menu. The time string is always output in the following format:-

```
HH:MM:SS.sss
```

where:

HH = Hours from midnight (00 to 23)
MM = Minutes into hour (00 to 59)
SS = Seconds into minute (00 to 59)
sss = Milliseconds into second (000 to 999)

The following example shows two lines of NMEA data played back with the playback time stamps enabled.

```
20-Oct-2004,22:05:29.228,$GPGGA,,,,,,0,07,,,,,,,*61
20-Oct-2004,22:05:29.290,$GPGSA,A,1,,,,,,,,,,,,,1.47,0.90,1.16*0D
```

9.7.1 Inserting the channel number into the playback stream

If the [I] option is enabled in the 'Time Stamping and Channel Number Playback Options' menu then a channel number representing which channel the data was recorded on is written to the output stream (in front of any time stamps that may also be selected for output). Channel number output will only work if the recorded data contains time stamps because the time stamps themselves contain the channel number information.

Channel 1 data is output as '1,' and channel 2 data is output as '2,'. Events logged from button pushes of digital state readings will have a channel number of zero and be output as '0,'.

The following example shows two lines of NMEA data and an 'On' button event played back with the playback time stamps and channel number output enabled where the data was recorded on channel 2.

```
2,20-Oct-2004,22:05:29.228,$GPGGA,,,,,,0,07,,,,,,,*61
2,20-Oct-2004,22:05:29.290,$GPGSA,A,1,,,,,,,,,,,,,1.47,0.90,1.16*0D
0,20-Oct-2004,22:05:31.120,$EVENT,ON,26*49
```

9.8 Controlling the Front Panel LEDs for Playback

Select the <L> item in the 'Playback Options' menu to toggle the state of the LEDs during playback. You might need this function if you are working in a dark room environment or you would prefer no visual distractions during a trial.

If a star character (*) appears to the left of the item, the LEDs will be active during playback (the default). If you want to run for as long as possible from a battery supply then disabling the flashing LEDs will help to conserve energy slightly to extend battery life.

Note that if this unit is given to another operator to use, there could be confusion over whether the unit is working properly if the LEDs are disabled during playback. It may look as though your AntiLog unit is not working at all in playback mode.

9.9 Using the Escape Key to Abort Playback

During normal playback, any characters that are transmitted back to AntiLog are ignored. It is therefore not possible to stop or abort an ongoing playback session with serial port input into AntiLog. This allows AntiLog to stream playback data to equipment that would normally be transmitting data as part of its normal operation.

If you do need to abort playback using a serial port connection rather than pressing the 'Off' button, you can enable the ASCII Escape character to abort playback.

```
*[A] Allow Escape key input to abort playback
```

If this item is active, as soon as AntiLog receives an ASCII Escape character (decimal 27) on any of the active playback serial ports then playback will be aborted. When playback has stopped, you can refresh the current menu by entering the space character.

10. The About Menu

The 'About Menu' provides an overview of the current AntiLog record, playback, and menu port settings. It also shows an overview of the General settings and gives a description of the embedded software configuration information (revision and build date), detected media and hardware options. The 'About Menu' is important as it can give the user a top level view of all the major settings as a quick check before starting an important trial.

The 'About Menu' is a key press away from the main menu and is unique in that it does not accept input options like other menus, it is only designed to display information text. The menu content alters depending on the options selected. The 'About Menu' is displayed by selecting the <A> item in the main menu.

The following is a typical example of the 'About Menu' output when a unit has been reset to factory defaults.

```
HARDWARE: AntiLogPro_OEM-M, REV F, ASL/23/001
FIRMWARE: V5.1, build 25-Mar-2011
(c) Anticyclone Systems Ltd, 2011   WEB www.anticyclone.co.uk

- Media detected: SDHC, FAT32 (4063137280 Bytes)
- Real Time Clock detected: (1372)
- Bootloader detected: AL_BootloaderXM,1.0,15-May-2010

  Record       =   4800,8,N,1,-  Record All
  Playback Ch1 = 115200,8,N,1,-  RAW
  Menu         = 115200,8,N,1,-  As Playback
  General      = ButtonErase,PSave

 <Press a key to return to the main menu>
?
```

10.1 Hardware and Software Revisions

The first line of text in the 'About' menu contains the text `HARDWARE:` followed by the application name `AntiLog`, `AntiLog_OEM`, `AntiLogPro` or `AntiLogPro_OEM`. This is followed by a dash character and any options that are installed. A full list of possible option codes which could appear in this position is given in section 17.1. The example shows a system where the ICD-GPS-15x ('M') option has been installed. Next is the hardware main circuit board revision code followed by the unit serial number (ASL/23/001 in the example).

The second line starts with the text `FIRMWARE:` followed by the embedded software version number and build date. The third line contains fixed text with a web address reference.

10.2 Detected Capabilities

The lines that follow the web address in the About text describe other detected capabilities in AntiLog. For V5.1, these include Media, Real time Clock and bootloader details. If your system does not contain a bootloader, real time clock, or inserted media some or all of these lines may not appear in the output.

Note that the format of the inserted media is for reference only as AntiLog does not use FAT or FAT32 format for data storage. However, media formatted as FAT32 will have less total storage available for data because of format overhead compared to the same media formatted

as FAT. You may want to consider formatting your media to FAT rather than FAT32 before use to obtain maximum storage capacity using AntiLog.

Note that the 'About' information will automatically update if you are able to extract and insert media cards.

10.3 Port and Settings Overview

The serial port settings are then listed for record, playback and the terminal menu system. Each setting is shown with the following format (the second format appears for AntiLogPro hardware only):-

```
baud_rate,bits_per_char,parity,stop_bits,rts
baud_rate,bits_per_char,parity,stop_bits,rts,inv
```

where:

`baud_rate` = Serial port baud rate.
`bits_per_char` = In the range 5 to 8.
`parity` = N for NONE, E for EVEN or O for ODD.
`stop_bits` = 1 or 2
`rts` = R for RTS/CTS hardware handshake, - for None.
`inv` = Signal line inversion options (AntiLogPro hardware only).
`!R` = Inverted Rx, `!T` = Inverted Tx, `!B` = Both Rx and Tx inverted.

Examples:

`115200,8,N,1,-`	(Standard AntiLog settings)
`9600,8,E,1,R`	(9600 baud, even parity, 2 stop bits and RTS/CTS)
`115200,8,N,1,-,!B`	(AntiLogPro settings with Rx and Tx inverted)

If the Dual Serial Port option is enabled, the serial port format is extended as follows:-

```
p:baud_rate,bits_per_char,parity,stop_bits,rts
p:baud_rate,bits_per_char,parity,stop_bits,rts,inv
```

where:

`p` = M for main serial port, S for secondary serial port.

Example:

```
M:115200,8,N,1,-
```

10.3.1 Recording port settings

The following is an example of the Recording port settings for dual channel recording:-

```
Record   Ch1 = M:  4800,8,N,1,-  Filtered NMEA,AscTStamp,Buttons
         Ch2 = S:  9600,8,N,1,-  ASCII Line sub sample,PollFn
```

Note that hardware handshaking (RTS) is not required for recording and so this element of the port setting output is always '–'. The feature codes following the port settings can be any one or more of the following:-

Text Code	Description
Record All	Records all incoming data without any data filtering
Filtered NMEA	Records only selected ASCII NMEA sentences
ICD-GPS-15x	Records ICD-GPS-15x compatible data
ASCII Line sub sample	Record using ASCII line sub sampling
NOLOG	Do not record any incoming serial port data to the recording stream
AscTStamp	Embed time stamps into data stream by removing data byte top bit
8BitTStamp	Embed time stamps into data stream allowing full 8 bit binary recording
NByteTStamp	Embed a time stamp before every 'N' bytes of data
MsgTStamp	Insert time stamp messages into recording stream
PollFn	Polling function has been activated for this recording channel
Buttons	At least one button event has been activated for this recording channel
EvIn	Event Input line will insert messages into recording stream

10.3.2 Playback port settings

The following is an example of the Playback port settings for dual channel playback:-

```
Playback Ch1 = M:115200,8,N,1,-  Real Time,SessionHdr,TStamp
         Ch2 = S:115200,8,N,1,-  Hexadecimal Dump,SessionHdr
```

The feature codes following the port settings can be any one or more of the following:-

Text Code	Description
RAW	RAW playback mode (full rate output, not real time)
Real Time	Real Time playback using time stamp information or NMEA message content
Real Time ICD-GPS-15x	ICD-GPS-15x compatible real time playback mode
Hexadecimal Dump	Hexadecimal binary and ASCII column dump mode
QinetiQ Prg	QinetiQ Ltd High Sensitivity GPS Production Programming mode
SessionHdr	Insert a session header in output stream at the start of each session
TStamp	Insert ASCII time stamps or time stamp messages in output stream
TShift	Time stamps will be shifted from recorded to the current time
RAWTStamp	Insert raw 6 byte binary time stamps in output stream
ChanID	Insert ASCII channel ID used for record in output stream
PBEscAbort	Playback can be aborted using the Escape key on any active playback port

10.3.3 Menu port settings

The following is an example of the Menu port settings:-

```
Menu          = M:115200,8,N,1,-  As Playback,Quiet
```

The feature codes following the port settings can be any one or more of the following:-

Text Code	Description
`As Playback`	Menu port settings are locked to playback channel 1 port settings
`Quiet`	Main menu will not automatically be shown when unit is powered on

10.3.4 General Menu settings

The following is an example of the settings currently active in the General menu and its sub menus:-

```
General       = ButtonErase,ForcedPB,PSave
```

The keywords can be any one or more of the following:-

Text Code	Description
`Dual`	The AntiLog hardware is configured for dual port operation. This must be active before you can choose dual port record or playback operation
`ButtonErase`	User allowed to erase all recorded data by pressing and holding the 'Off' button and then holding the 'On' button when the data is erased and playback mode is activated
`ForcedPB`	AntiLog will always power up into playback mode regardless of the time the 'On' button is held down
`PSave`	Automatic power saving is enabled
`(none)`	None of the general options listed above are active

11. Baud Rate Selections

Selecting the correct port settings and baud rate are critical to the successful operation of AntiLog. To make baud rate setting as easy as possible, a list of standard baud rates are provided and a single key press selects the required rate. In all cases, you are additionally able to specify a user defined baud rate for non standard rates.

11.1 Baud Rate Menu Examples

The following menu is used to select the record baud rate from the Port Options in the 'Recording Options' menu:-

```
==== Set Record RS232 Serial Port Baud Rate ====

 [0] 921600
 [1] 460800
 [2] 230400
 [3] 115200
 [4] 76800
 [5] 57600
 [6] 38400
 [7] 28800
 [8] 19200
 [9] 14400
 [H] 9600
*[I] 4800
 [J] 2400
 [K] 1200
 [L] 600
 [M] 300
 <U> User defined baud rate: {11111, Rate error=0.0%}
 <ESC>
?
```

1. *921600 baud only available on AntiLogPro hardware*

The following menu us used to set playback and menu system baud rates:-

```
==== Set Playback RS232 Serial Port Baud Rate ====
(Data transfer and 'On' button aware)

 [0] 921600
 [1] 460800
 [2] 230400
*[3] 115200
 [4] 76800
 [5] 57600
 [6] 38400
 [7] 28800
 [8] 19200
 [9] 14400
 [H] 9600
 [I] 4800
 [J] 2400
 [K] 1200
 [L] 600
 [M] 300
 <U> User defined baud rate {11111, Rate error=0.0%}
 : :
```

```
 <S> Start playback now (or use 'On' button)
 <Esc>
?
```

1. *921600 baud only available on AntiLogPro hardware*

These two baud rate selection menus appear when a change of baud rate is requested. The star character (`*`) shown which baud rate is currently active. Note that for playback baud rate selection, there is an additional option to allow immediate playback of stored data and the menu is 'On' button and 'Data Transfer' aware.

If you have set a playback baud rate which you cannot remember, you may not be able to view the terminal menu system again until you select the correct terminal baud rate on the host machine. Use the 'Playback and Menu Port Reset' power up sequence (See section 5.2) to restore the playback baud rate to a known value if you do not know the current setting.

11.2 User Defined Baud Rate Selection

If the baud rate you require does not appear in the displayed baud rate list then you can enter a value manually. Use the `<U>` item and enter a baud rate in the range 113 to 460,800.

```
Enter User baud rate between 113 and 460800 {11111}:
```

If the desired user baud rate is already shown (11111 in the example above) then you can simply hit the Enter (or Return) key to select this rate without re-entering the value.

Each channel supports its own independent user defined baud rate but this value is common for record, playback and the menu system on a given channel. For example, it is not currently possible to choose one user defined value for record and a different user defined value for playback for the same channel.

It is also not possible to set every possible baud rate combination from 113 to 460,800 with the single clock source that AntiLog uses and so a baud rate bit error may be present for a desired baud rate. The serial port baud rate menu shows any baud rate bit error, the bigger the error, the more prone to data errors the serial connection will be. In general, errors of 2% and more are not acceptable and may cause data link errors.

12. The AntiLog Data Transfer protocol

As soon as AntiLog is switched on in playback mode it is able to respond to a host request for logged data using a special AntiLog Data Transfer Protocol. Called ASLMTx2, the built in transfer protocol allows recorded data to be transferred over a serial port connection to a host machine in a reliable way. Menus that support the Data Transfer protocol appear with the following text below the title:-

```
(Data transfer and 'On' button aware)
```

If AntiLog is connected to the host machine via an appropriate cable (e.g. a NULL modem cable) and the menu shows the Data Transfer aware text then there is no need to perform any other action other than to ensure the AntiLog menu baud rate matches the baud rate of the software intending to perform the data transfer. If the menu system baud rate and host baud rate settings are different, no data transfer can take place.

The transfer protocol is robust and can even allow for momentarily disconnect of the NULL modem cable during a transfer without causing loss of transferred data. Each transmitted data packet has a 16 bit check sum quantity (CRC) added to ensure data integrity at the host. You can use this connection to upload recorded data from either of the two hardware serial ports that the menu system is currently assigned to.

At the time this user guide was prepared, there is one existing application already available called AntiLogReader (which is available free of charge from the www.anticyclone.co.uk web site) which is able to use the ASLMTx2 protocol to upload recorded data to a PC.

Such host software may give a real time indication of the Data Transfer progress and AntiLog will repeatedly flash four green LED flashes in a row followed by a time gap to show it is in the ASLMTx2 Data Transfer mode. When a transfer has completed, the green LED will go back to flashing once followed by a time gap to indicate it has returned to the main menu system.

13. RTC Backup Battery

The boxed version of AntiLog and all versions of AntiLogPro are supplied with a battery backed Real Time Clock.

13.1 RTC Battery Backup for AntiLog Hardware

For the original AntiLog hardware, the backup battery is required to supply approximately 2uA when all other power sources to AntiLog have been removed. If AntiLog stops showing a valid time and date on the main menu when it is powered up or an RTC content invalid message is shown then the backup battery will need replacing. The battery for the standard boxed AntiLog product is a 3V 2032 coin cell mounted to a PCB fitted to the AntiLog lid.

To gain access to the backup battery, open the battery compartment and remove any PP3 cell fitted. Remove the four screws in the base of the box and carefully pull the two box parts apart. The coin cell in the lid can now be replaced. Take care when replacing the coin cell to ensure new battery is inserted with the correct polarity and that no damage occurs to the coin cell holder.

Carefully align and fit the two box halves together, don't fit the screws at this stage but refit a PP3 battery to test the new cell. Turn AntiLog on in playback mode. The main menu will report an RTC power failure – this is OK because you have just replaced the cell. Go to the General Menu and set a new time and date. Turn the unit off and back on again in playback mode. The new time and date should appear in the main menu. If all is well, replace the four screws.

If there is still a problem, remove the PP3 battery again, pull the box halves apart and inspect the battery connection. Refit the battery and reassemble and test again.

13.2 RTC Battery Backup for AntiLogPro Hardware

The battery used for AntiLogPro hardware is a rechargeable Lithium coin cell mounted in a holder on the main PCB. This cell is trickle charged all the time AntiLogPro is switched on. It can be replaced if it ever becomes faulty or loses the ability to retain charge.

It is recommended you power on your AntiLogPro unit at least once every six months or so to top up the charge if you do not use your unit for other purposes. Switch your unit on and leave it switched on for at least 12 hours. The charging circuit trickle charges the battery so it is therefore safe to leave AntiLog switched on permanently for data logging or any other reason if needed. When fully charged, the battery backup supply will nominally last for six months or more when AntiLogPro is turned off depending on storage temperature.

14. Problem Solving

14.1 General Problems

14.1.1 AntiLog will not switch on

AntiLog is switched on by pressing the 'On' button either briefly (recording mode) or for just over a 1¾ seconds (playback mode). You should then see a solid red (recording mode) or green (playback mode) long flash from the bi-coloured LED. If pressing the 'On' button appears to have no effect then work through these checks.

For internal battery operation.

- If the menu system comes up but no LED flashing is seen, you may have LEDs disabled in the recording or playback menus.
- Remove the battery cover and ensure the battery connection is correctly made. Important - do this actively by disconnecting the battery using the PP3 clip and reconnecting it. Try switching on again.
- Either replace the battery immediately with another cell or check the voltage of the battery with a meter. For a PP3 battery, this should be at least 8V or more. Even though the battery may register sensible looking results off load, attempt to switch the unit on whilst monitoring the battery voltage. You may find the voltage drops to 3V or less under load – replace the battery.
- In an extreme case, the media card may have partially come out of its holder and caused a problem at power up. Check the insertion of the card. Undo the four main screws on the underside of the unit and carefully pull the lid and base apart. Undo the single screw securing the PCB to the base of the box and carefully lift the whole PCB out. On the underside of the card you will see the flash memory card and holder. Remove and replace the flash memory card a couple of times to ensure a positive connection. Refit the PCB into the case, fit the board retaining screw, and replace the lid and four screws ensuring no wires are trapped as you secure the lid.

For an external DC power source.

- Ensure you really are supplying the power you expect with the positive supply being fed to the centre pin in the DC external power feed. If the unit has an internal battery fitted and appears to have been working before but has suddenly stopped it may be because the external power is not correctly connected and the unit has run down the internal PP3 battery instead.
- Ensure the DC power socket is designed to fit with the 6.5 mm barrel and 2.1 mm inner pin size and not the larger 2.5mm inner pin type for the original AntiLog hardware.
- The external power source should be regulated and able to supply at least 50mA during start up and about 20mA (5V supply) or 10mA (9V supply) for normal continuous operation.

14.1.2 I can't see the terminal menu in playback mode.

- Ensure you are using the right RS232 cable. For connections to a PC or PDA you should be using an RS232 NULL modem cable, not a cable with 1:1 pin connections.
- The AntiLog serial port settings may be different to the terminal settings. Ensure you have your terminal set up for 115200 baud, 8 bits, no parity, one stop bit, no hardware handshaking and it is 'connected' to the correct serial COM port on your host PC or PDA. To automatically restore AntiLog to these default playback and menu port settings, switch off AntiLog by holding down the 'Off' button for more than one second. With the unit

switched off, press *and hold* the 'On' button until both LED segments light (yellow), then release. This has forced AntiLog to reset the playback and menu baud rate to the default 115200 baud, 8 bits per RS232 character, no parity and one stop bit. Restart the terminal program or maybe even reboot the host if this does not work. Can you see serial output from other hardware on the host system's serial port?

- If you have the Dual Serial Port feature enabled, ensure you are using a custom dual serial port lead for serial port connections because the RTS/CTS lines on the AntiLog port connector will no longer act as RTS/CTS in this mode.
- Ensure you are seeing a single flashing green LED from AntiLog. If there is more than one green flash then AntiLog thinks it is transmitting data so press the 'Off' button momentarily and check again.
- You may have 'Menu Quiet' active in the 'General' menu. Type the space bar to see if terminal menu appears.

14.1.3 I cannot start the unit in record mode

If the unit always starts in playback mode, check the 'Power Management and Start Up Options' menu. If 'Forced Playback' is selected for example, the unit will always start in playback mode.

14.1.4 I see a single red or green flash at start up but nothing else

If the LED flashes once only red for record mode or once only green for playback mode when you hold the 'On' button to switch on then the LEDs may have been disabled in the recording or playback menu. Switch on in playback mode and use a terminal program to look at the 'LED enabled' settings in the menu system.

14.1.5 My PC says it wants to install new drivers when I boot up

If you boot your Windows PC with AntiLog switched on in playback mode, you may see messages saying your system has found new hardware and wants to install new driver software (for example it may say it has found a new bus mouse). This is because the plug and play system under Microsoft Windows wants to recognise equipment connected to the serial bus and may send commands to the serial bus to establish what equipment is connected. If it does do this, and you don't have the options lock active in the playback menu system then it is possible that AntiLog settings could get changed.

- Cancel any requests to install new hardware.
- Insure your AntiLog settings are still correct using a terminal program.
- If you want to boot your PC with AntiLog switched on, consider using the options lock.

14.1.6 The unit won't respond to either the 'On' or 'Off' button.

In an extreme situation, it may just be possible to cause the unit to stop responding to the 'On' and 'Off' buttons. Remove any external source of power and then remove the battery cover and disconnect the battery for a few seconds and reconnect it. The unit should now work as normal.

14.1.7 The last digit of the current date and time in main menu acts strangely.

If you keep refreshing the main menu (with the space bar key for example) the last digit in the time field of the main menu date and time display may look like there is some kind of problem with time in AntiLog. You may expect this last digit to appear almost random because it is the millisecond field responding to your keyboard input. It may appear to count up or down

slowly for each update. This is perfectly normal operation and the apparent 'counting' is down to the way AntiLog time slices the menu update and is not due to a clock resolution problem.

14.2 Recording Problems

14.2.1 The data I logged appears corrupted

- If you are trying to use a terminal program on a PC to 'capture' the data from an AntiLog unit and the terminal output is broken up, it may be that the recorded data isn't corrupt. It is highly likely that the PC terminal program cannot keep up with the data rate transmitted from AntiLog. Either reduce the output baud rate, use a more capable terminal program and/or PC hardware and/or upload the data to the host using an ASLTx compatible application to upload the data, such as the AntiLogReader application.
- Some PC terminal applications respond badly to binary data being transmitted at them. In particular, if a binary zero is transmitted at some terminal applications, subsequent characters may not appear at all or may appear corrupt. The problem in this case is with the terminal application, and not AntiLog. Try using a different PC terminal application.
- The record baud rate and RS232 data bits per character must match the source baud rate and data bits. Double check on these settings using the terminal menu system.
- The cable used for recording (or playback) may be defective (e.g. the ground wire may be disconnected giving the illusion of working properly some of the time).
- Cable length excessive at high baud rates. You may need to use short cable lengths for recording 230,400 and 460,800 baud data sources using the original AntiLog hardware.
- Make sure you have selected the correct recording mode. If filtered GPS NMEA or the sub sample filter is activated in error you will not record the data you expect.
- If you intended to record binary or 8 bit data, make sure the ASCII line time stamp feature is not active in the Recording Options menu.
- Are you sure you are playing back the correct channel data? You may be looking at data recorded on the other channel.
- Use the AntiLog playback hexadecimal dump mode to see exactly what did get recorded at the byte level. This may give a clue as to why the data is not as expected.

14.2.2 I see three or four flashing red LEDs in recording mode

The flash media card cannot be detected or it may be defective. In an extreme situation (i.e. the unit gets dropped) the flash memory card may have become unseated from its holder. Undo the four main screws on the underside of the unit and carefully pull the lid and base apart. Undo the single screw securing the PCB to the base of the box and carefully lift the whole PCB out. On the underside of the card you will see the flash memory card and holder. Remove and replace the flash memory card a couple of times to ensure a positive connection. Refit the PCB into the case, fit the board retaining screw, and replace the lid and four screws ensuring no wires are trapped as you secure the lid.

14.2.3 I see five flashing red LEDs in recording mode

The flash media is full. Switch off AntiLog using the 'Off' button and upload the recorded data in playback mode. You will need to erase the data on the card before attempting to record more.

14.3 Playback Problems

14.3.1 The output 'breaks up' on my terminal screen during playback.

If you are using a terminal program on a PC which is configured with a baud rate of 19200 or higher you may see corrupt data on screen (especially using Microsoft's own HyperTerminal program) during AntiLog data playback. The effects are especially noticeable with the hexadecimal playback mode. This is because the PC cannot keep up with the supplied data rate from AntiLog. Use a slower baud rate for playback or a faster PC.

Note that Desktop PCs appear to work better than laptop or notebook PCs for capturing RS232 data. Do not try to capture important data that has been recorded with AntiLog by simply playing it back into a terminal program with local logging enabled. Use an application that supports the ASLTx transfer protocol such as the AntiLogReader application because this has more integrity with CRC checksums built into the transfer protocol.

14.3.2 I can't stop the playback once it has started.

Use the 'Off' button to stop playback, followed by typing a space bar at the terminal if required to refresh the menu system. Terminal keyboard entry will not stop data playback, you must briefly press the 'Off' button.

14.3.3 I have started playback but nothing is coming out

- If you are playing back with a real time playback option selected, you may have to wait for up to ten seconds for the first data to be played back if the first time stamp and a second time stamp are very different (e.g. years apart).
- If you are playing back dual channel data and the other channel has lots of data recorded before you actually have data recorded for the first channel, then you must wait for AntiLog to seek to the point where the first channel data appears. This is true if you record for example a single session on channel one then a dual session and try and play back channel 2 data – you have to wait until AntiLog reads past the first session before data is output.
- Use the About menu to check if the playback port settings are at the same rate as your terminal and that the output is set to the hardware port you are connected to.

15. Abbreviations

ASCII	American Standard Code for Information Interchange
COM	Serial communications port
CTS	Clear To Send (RS232)
DC	Direct Current
EXOR	Logical Exclusive OR operation
FAT	File Allocation Table (Microsoft file system)
GPS	Global Positioning System
LED	Light Emitting Diode
NMEA	National Marine Electronics Association
OEM	Other Equipment Manufacturer
PC	Personal Computer
PCB	Printed Circuit Board
PDA	Personal Data Assistant
PP3	9 Volt battery with stud connections on the top.
RS232	A common physical interface standard specified by the Electronic Industries Association (EIA) for the interconnection of devices.
RTC	Real Time Clock
RTS	Request To Send (RS232)
UTC	Universal Coordinated Time

16. Appendix A – Standard Feature Set

16.1 AntiLog Standard Feature Set

All OEM and boxed AntiLog products are supplied with the following capabilities as standard when running V5.1 of the embedded firmware:-

16.1.1 General features

- Fully unattended operation possible including automatic power and log file shut down.
- Up to 32GByte non volatile MMC, SD and SDHC storage options supported.
- At least 48 hours of recording time possible from a single PP3 Alkaline battery
- Extended operation possible with long life PP3 Alkaline cells or external power source.
- Supports external DC power source in the range 4.5 to 18V.
- Battery health check via menu system with terminal load voltage report.
- Dynamic power management system saves power for slower baud rates and gaps in data.
- File system supports real time date and time tagging of session and event information.
- Media recovery feature for comprehensive data recovery.
- Built in system 'bootloader' to allow embedded software upgrades via the serial port.

16.1.2 Recording features

- Can log ASCII text, binary data or any other combination.
- Can log 230,400 baud data at full rate (no handshaking required) with suitable media. AntiLogPro hardware can log up to 921,600 baud full rate.
- Selected GPS NMEA sentences can be logged using the built in NMEA sentence filter.
- Intelligent data frame sub-sampling for ASCII line formatted data sources (e.g. NMEA).
- Recorded data can be time tagged with millisecond resolution.
- Binary data can be time tagged using 'N' byte time tagging mode.
- User equipment commands can be sent at user defined repeat rate (for equipment polling).
- Can log 'user events' during record using the 'On' and 'Off' buttons.
- Can log the logical state of selected digital input lines during record.

16.1.3 Playback features

- Full rate RAW playback available.
- 'Real time' playback to simulate original equipment output.
- Playback time shift to replace recorded time stamps with current time stamps.
- Playback can be synchronised to external event input (wait on hardware pulse).
- Hexadecimal playback mode to display recorded data as a ASCII hexadecimal dump.
- Selectable RTS/CTS handshaking for playback (single serial port mode only).
- Session headers and time stamp date and time can be embedded in output stream.
- ASLMTx2 Data Transfer protocol built in for uploading recorded data to a host machine.

16.1.4 Configuration features

- Independently programmable transmit and receive baud rates from 113 to 460,800 (113 to 921,600 for AntiLogPro hardware).
- User selectable parity, data bits per character (5 to 8) and stop bits.
- Non standard baud rate support (e.g. 11111 baud).
- Complete sets of user options can be saved with a name and recalled for later use.
- Up to four user equipment commands can be stored for output during record mode.
- Time transfer function to accurately transfer time and date to another AntiLog unit.
- Unit can be forced to always start in playback mode.

16.2 Feature Set for AntiLog Hardware REV C and Later

For users of AntiLog hardware with revision C or later, the following additional features are available:-

- Support for two independent serial ports including dual port logging.
- Full rate data capture possible from two 115,200 baud data sources.
- User can select which ports are used for record and playback and the menu system.
- Real time dual serial port playback available.
- Independent equipment polling on both channels
- Independent button even logging on both channels.
- Both serial ports available from front panel 9 way D connector with adapter cable.
- OEM version of the product also allows access to CMOS 3V3 level RS232 connections for the secondary serial port for direct connection to data source (e.g. a GPS OEM engine).

16.3 Feature Set for AntiLog Hardware REV E and Later

For users of AntiLog hardware with revision E or later, the following additional features are available:-

- Support for new Real Time Clock (RTC) hardware (lid mounted RTC – available as a hardware upgrade).
- About menu shows lid mounted RTC serial number.

16.4 Feature Set for AntiLog Hardware REV F and Later

For users of AntiLog hardware with revision F or later, the following additional features are available:-

- Support for Real Time Clock (RTC) hardware on board (OEM REV F and above + lid mounted RTC hardware).
- Hardware support for Secure Digital (SD), Secure Digital High Capacity (SDHC) as well as MultiMedia Card (MMC) storage.
- Support for factory fit forced Power Option ('P' Option).

16.5 AntiLogPro specific features

- AntiLogPro OEM channels can be assigned from one of three physical serial ports: Primary, Secondary and Auxiliary.
- Supports baud rates up to and including 921,600.
- Selectable 'Ring Buffer' data storage method.
- RS232 data lines can be individually inverted.
- Dedicated 1PPS output which is synchronous to on-board one second time stamp epoch (Accessible on AntiLogPro OEM hardware).
- 9 Way D connector can support up to two dedicated digital inputs (pins 1 and 9).
- Support for two panel mounted bi-colour LEDs.
- RTC and battery backed power source built onto main PCB.

17. Appendix B – Option Packs

17.1 Option Pack Codes

The following table lists all software and hardware option pack codes recognised in V5.1.

Option	*Option Function (software)*
D	Force 'Dual Serial Port Operation' during reset to factory defaults.
L	Menu baud rate lock
M	Military/Government ICD-GPS-15x GPS receiver Instrumentation Port protocol
N	NOLOG. Allows unit to operate without media present in record mode for equipment initialisation purposes.
S	Security. Adds password control to playback mode preventing unauthorised unit access. Protects menu system configuration, unit playback and firmware revision.
X	Extends 'On' button push for playback mode to 5 seconds during start up.
Option	*Option Function (hardware)*
P	Forced Power. Appends data to log file when power is applied. Stops logging when power removed. No need to push any buttons to start logging.
R	Original AntiLog hardware: Real Time Clock (RTC) detected on board (e.g. built into OEM board)
[R]	Original AntiLog hardware: Real Time Clock (RTC) detected externally (e.g. in the lid of the boxed variant).

The root menu shows which options are in use in a given system as a series of option codes after the word "AntiLog-". For example, the following unit has the 'P', 'M' and 'L' options active and the OEM Real Time Clock present, 'R'.

```
AntiLog-PMLR 5.1, Serial number ASL/16/001, 19-Jun-2009 17:24:56.876
```

17.2 Software Options

Software options can be added after purchase if required. Contact your AntiLog supplier for more details.

17.2.1 'D' Option – Force Dual Serial Port Operation

On a standard AntiLog unit, the "`<R> Reset all options to factory defaults`" item in the 'General Options' menu resets all settings back to factory defaults including the "`[D] Dual Serial Port Mode`" flag. With the 'D' option active, it will be set instead of cleared and hence the unit will default to dual serial port operation. This option is useful if you are installing an AntiLog unit into a system which will always use multiple hardware serial ports.

17.2.2 'L' Option – Menu Port lock

The 'L' option prevents users from activating the menu port reset function if the settings lock is active. Holding down the 'On' button at start up for more than ten seconds would normally cause AntiLog to reset the menu and playback port settings to the factory defaults.

If you have the 'L' option installed and the settings lock is active, then your root menu may look like the following example:-

```
AntiLog-L[R] V5.1, Serial number ASL/16/001, 03-Oct-2009 17:29:45.867

(24682934 bytes recorded in 5 sessions, 2% of 986.8MB)
(PLAYBACK mode, Data transfer and 'On' button aware)

 <S> Start playback now (or use 'On' button)
 !LOCKED! Recording options
 !LOCKED! Playback options
 !LOCKED! General options
 <L> Lock user options
 <B> Battery check
 <A> About AntiLog
 <U> Shut down
?
```

If you attempt to perform a menu port reset with the settings lock on, the request is ignored and no settings will be changed. The 'L' option in combination with the menu settings lock is useful if you know exactly how you have set up units in the field and want to prevent users having any means to change the settings without access to a terminal program and a NULL modem cable.

17.2.3 'M' Option – ICD-GPS-15x

The AntiLog 'M' option provides additional menu items to control the recording and real time playback of ICD-GPS-150, ICD-GPS-153, and other compatible military/government/civil GPS Instrumentation Port (IP) data streams. The 'M' option adds the following capabilities to the standard AntiLog feature set for all hardware revisions:

- ICD-GPS-150, ICD-GPS-153 (ICD-GPS-15x) data stream compatible.
- Start of incoming messages can be time tagged to millisecond resolution.
- Message 'autoconnect' feature to automatically request selected message IDs.
- Up to eight message IDs can be defined for connection per logging session.
- Automatically sends acknowledgements to equipment acknowledge requests.
- Can inserts IP compatible custom messages to log button events during record.
- Can inserts IP compatible custom messages to log digital bit state during record.
- Compatible with SPGR, PLGR, DAGR GPS receiver RS232 outputs.
- Real time playback (including dual channel) option for recorded ICD-GPS-15x data.
- Time stamp information can be used for real time playback.
- Option to enable output of custom time stamping information in IP data stream.

More detail can be found in the “AntiLog-'M' RS232 Data Logging System ICD-GPS-15x supplement” [Ref 2004001] supplied with the option.

17.2.4 'N' Option – NOLOG

If you need to initialise equipment in the field but do not want to log data from the equipment (because the data from the equipment may be sensitive) then you can use the NOLOG option to allow AntiLog to operate in record mode without media present. This option is particularly useful in combination with the military 'M' option where you wish to initialised a GPS receiver using, say, the ICD-GPS-153 protocol so that it outputs specific IP messages, but you are then not permitted to record the data output from the receiver.

17.2.5 'S' Option – Security (password controlled menu access)

With the 'S' option installed, you can set a playback menu password and then it is not possible to start AntiLog in playback mode without correctly specifying a user password. This option is useful if you want to completely protect a unit against unauthorised configuration changes or configuration inspection. It also prevents data playback from the unit and will not allow software upgrades until successful password entry. Record mode works as normal.

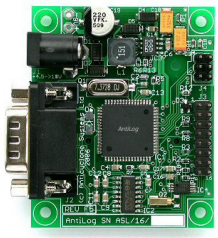
17.2.6 'X' Option – Extended Playback 'On' delay

When the 'X' option is active, the 'On' button is required to be pressed for more than 5 seconds before playback mode is activated at start up instead of the normal more than 1¾ seconds.

17.3 Hardware Options

Hardware Options are usually factory fit options but in some circumstances it is possible to perform customer upgrades.

17.3.1 'P' Option – Forced Power



Standard AntiLog hardware requires the user to push the 'On' button to start data logging and the 'Off' button to correctly terminate a data logging session. AntiLog units that are supplied with the Forced Power ('P') option do not require button pushes to start or stop data logging, the application or removal of a power source is all that is required to start and stop a data logging session. The 'P' option hardware is therefore ideal for use in environments where no user intervention is possible or desirable for data recording, such as in vehicle installations.

- 'On' button (when fitted) still allows playback mode and normal 'On' button events.
- Robust data logging in situations where the power source cannot be guaranteed.
- Same full feature set as a standard AntiLog unit including dual channel data logging.
- Can be configured to conditionally start in playback mode using asserted input line.

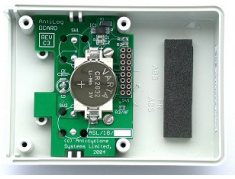
Please note that it is not normally possible to retro-fit the 'P' option to existing AntiLog hardware. See the “Forced Power option for AntiLog ('P' option)” [Ref 2006005] user guide supplied with this option pack for more details.

17.3.2 'R' Option – OEM Real Time Clock

If a Real Time Clock (RTC) device is detected on the main original AntiLog PCB, then the 'R' option is displayed. This is the case with the OEM version of AntiLog with RTC fitted.

This option does not apply to AntiLogPro hardware which always has the RTC device fitted to the main PCB.

17.3.3 '[R]' Option – External Real Time Clock



If a Real Time Clock (RTC) device is detected on the original AntiLog I2C bus then the '[R]' option is displayed. This is the case for the boxed version of AntiLog with the RTC circuit built into the lid assembly.

If a boxed unit was ordered without the RTC hardware option, it is possible to simply replace the existing lid assembly with an RTC version if required to add this hardware option at a later

date. The lid assembly is self contained with its own backup battery and it still operates even when it is unplugged from the base of the unit. Replacement lid upgrades are available from your AntiLog supplier.

This option does not apply to AntiLogPro hardware which always has the RTC device fitted to the main PCB.

18. Appendix C – RS232 Connections

Pin	*RS232 Function*	*AntiLog connections*	*AntiLogPro connections*	*Direction*
1	Carrier Detect	[Not connected]	Digital Input	in
2	Receive Data	Main Port, Receive (Rx1)	Main Port, Receive (Rx1)	in
3	Transmit Data	Main Port, Transmit (Tx1)	Main Port, Transmit (Tx1)	out
4	Data Terminal Ready	Data Terminal Ready (DTR)	Data Terminal Ready (DTR)	out
5	Signal Ground	Signal Ground (GND)	Signal Ground (GND)	-
6	Data Set Ready	Data Set Ready (DSR)	Data Set Ready (DSR)	in
7	Request To Send	Request To Send (RTS) or Secondary Port, Transmit[1] (Tx2)	Request To Send (RTS) or Secondary Port, Transmit (Tx2)	out
8	Clear To Send	Clear To Send (CTS) or Secondary Port, Receive[1] (Rx2)	Clear To Send (CTS) or Secondary Port, Receive (Rx2)	in
9	Ring Indicator	[Not connected]	Linked to EventIn (boxed), Routed to J3 pin 18 only (OEM)	in

[1] Only available on AntiLog hardware revision C or higher with Dual Serial Port Enabled.

Table 1: 9-way D Connector Wiring

18.1 DC Power

External DC power can be supplied via a 6.5/2.1mm power jack for AntiLog and a 1.3mm power jack for AntiLogPro. Note that the power jack does not disable the internal PP3 cell so the voltage supplied must exceed the battery terminal voltage of the fitted PP3, otherwise power will be taken from the battery in preference to the external source.

Power supplied through the DC socket cannot charge the internal cell. If a rechargeable PP3 battery is used then this must be taken out of the AntiLog case and charged separately.

18.2 Dual Serial Port Cable

The dual serial port feature is only available to users of AntiLog hardware with REV C or later. A 'V' shape or 'Y' shape cable is required to access both serial ports from the single 9 way D connector fitted to AntiLog. The cable presents two 9 way plugs that look like PC connections. Each of these plugs has connections to maintain hardware handshaking to allow most connected equipment to function normally. The 9 way D socket on the cable connects to the main 9 way plug on the end of the AntiLog unit.

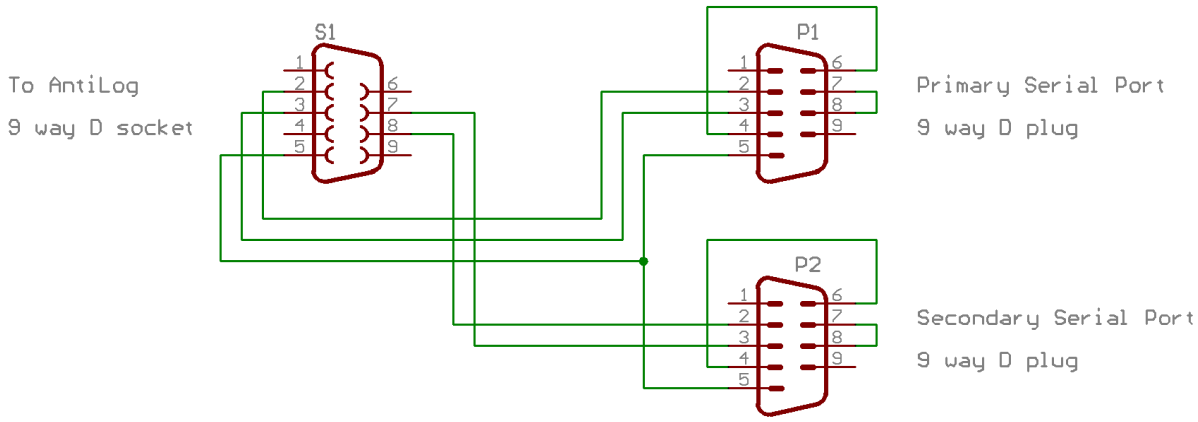


Figure 13: Dual serial port cable wiring

18.3 Dual Port Data Sniffing Cable

If you need to monitor RS232 data traffic in both directions (full duplex) on an existing RS232 link, you can use a data sniffing cable. By inserting the S2, P2 through port connector pair below in line with your existing connection you can monitor both the bus transmit and receive signals, even if they are at different baud rates because you can configure the two AntiLog channels to match.

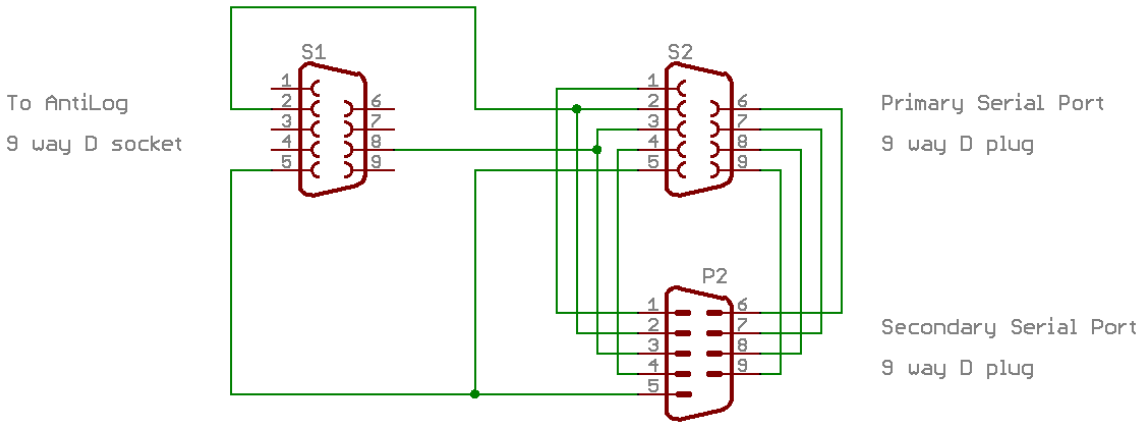


Figure 14: Dual port data sniffing cable wiring

19. Appendix D – LED Flash Codes

19.1 Recording Errors

A time gap immediately followed by a flashing red LED indicates AntiLog is in record mode. If a red LED flash is immediately followed by one or more green LED flashes then this indicates that data is being read in from the RS232 port and is being written to the internal flash media store. If no green LED flashes follow the single red LED flash then the system is not seeing new data.

If more than one red LED flash is seen (and no green flashes are seen), this indicates an error. The total number of red LED flashes following each time gap indicates an error as follows:-

Total Number of red LED flashes during recording mode	*Error Condition*
2	Flash media is write protected
3	Flash media store not present (not detected)
4	Flash media is not responding to commands
5	Flash media store is full

19.2 Recording Modes

AntiLog can record data in one of four modes. The number of green LED flashes that follows the red recording flash indicates the recording mode. Green flashes only appear after the single red flash if new data is being written to the flash store. In filtered modes, AntiLog may be processing incoming data but not actually writing the data to store because the filter is required to ignore the data seen.

Total Number of green LED flashes during record mode	*Recording Mode*
1	Recording all data seen at the RS232 input.
2	Recording filtered NMEA sentences output.
3	[reserved for Military option]
4	Recording ASCII line sub sample filter output

19.3 Playback Modes

A gap immediately followed by a flashing green LED indicates AntiLog is in playback mode.

Total Number of green LED flashes during playback mode	*Playback Mode*
1	Playback mode, terminal menu system active.
2	Playing back data in RAW playback mode.
3	Playing back data in 'real time NMEA' playback mode.
4	ASLTx data transfer in progress.
5	[reserved for Military option]
6	Hexadecimal Dump Playback

19.4 Playback Error Codes

If one or more of the LED flashes immediately following the first green flash is red, then an error condition has been detected. The following table shows the errors detected in terms of the total number of red flashes seen following the playback green flash.

Total Number of red LED flashes during playback mode	*Error Condition*
2	Flash media store not present (not detected)
3	Flash media is not responding to commands

19.5 LEDs During Media Data Recovery

When AntiLog is performing media data recovery, both the red and the green LEDs will flash together six times followed by a gap. This sequence will repeat until the recovery process has completed. The media recovery process may be terminated early by momentarily pressing the 'Off' button.

20. Appendix E – AntiLog Equipment Specifications

20.1 AntiLog: Absolute Maximum Parameters

Parameter	*Min*	*Max*
External DC voltage	-30V	20.0V
PP3 clip supply voltage (operating)	-30V	20.0V
RS232 data input voltage levels	-25.0V	25.0V
RTC Battery Backup voltage	-0.5	7V

20.2 AntiLog: Normal Operation

Parameter	*Minimum*	*Typical*	*Maximum*
Nominal operating duration from internal PP3 cell (1)	48 Hours	72 Hours	-
Operating temperature	0°C (8)	-	70°C (8)
Supply voltage (internal and external, operating)	4.3V	9.0V	18.0V
Power consumption	12mW(2)	58mW	90mW (5,7)
Power consumption (off - standby)	-	91µW	-
RTC backup battery voltage(9)	1.9V	3V	3.3V
RTC backup battery current(3)	-	<2uA	-
Weight (boxed unit, with battery fitted)	-	150g	-
RS232 baud rate	113	115,200	460,800 (4)
Maximum guaranteed sustained full rate data logging speed	-	115,200 (6,7)	230,400 (4,5,7)
RS232 switching input threshold - Low	0.6V	1.2V	-
RS232 switching input threshold - High	-	1.5V	2.4V
Size (boxed unit, W x L x D)	-	65 x 93 x 31mm	-
Media life expectancy (FLASH media card specific, card supplied)	-	1,000,000 write operations	-
Number of changes to system settings.	500,000	-	-

1. Test conditions: Continuous data logging of a single channel of GPS NMEA data at 4800 baud using a Duracell Plus PP3 cell and 236MByte SD 80x flash media.
2. Test conditions: Record mode, dual channel 4800 baud, no Tx connections, LEDs disabled, waiting for more data.
3. RTC backup current drops to below 1uA when AntiLog is switched on.
4. The RS232 driver chips used in the AntiLog board revisions 'A' to 'C' are only rated for transmit at up to 140kbaud into a full 3kOhm, 1000pF load. Similarly, the drivers for AntiLog board revisions up to 'F' are rated to 400kbaud. Performance may therefore be effected by long cable lengths. Recording data at the upper baud rate of 460,800 is possible with short cable lengths even with revision 'C' hardware. Note that the 'standard' serial port UART fitted to most PCs cannot operate at such a high speed, the top baud rate available is normally limited to 115,200.
5. Test conditions: Continuous data logging of replayed test data at full data rate 230,400 baud, single channel, using a Duracell Plus PP3 cell, 256MByte SD 80x flash media option and a 1.8m RS232 connecting cable.
6. Test conditions: Continuous data logging of replayed test data on two channels simultaneously, each at full data rate 115,200 baud, using Duracell Plus PP3 cell, 256MByte SD 80x flash media option and a 1.8m RS232 connecting cable.
7. Maximum recording rate and unit power consumption is ultimately limited by performance of FLASH media card in use.
8. Environmentally tested extended temperature range versions available upon request.
9. Only applies to AntiLog units supplied with Real Time Clock (RTC) hardware.

21. Appendix E – AntiLogPro Equipment Specifications

21.1 AntiLogPro: Absolute Maximum Parameters

Parameter	*Min*	*Max*
External DC voltage	-30V	20.0V
PP3 clip supply voltage (operating)	-30V	20.0V
RS232 data input voltage levels	-25.0V	25.0V
Digital input voltage range	-40.0V	40.0V

21.2 AntiLogPro: Normal Operation

Parameter	*Minimum*	*Typical*	*Maximum*
Nominal operating duration from internal PP3 cell (1)	48 Hours	80 Hours	-
Operating temperature (6)	0°C (6)	-	70°C (6)
Supply voltage (internal and external, operating)	4.3V	9.0V	18.0V
Power consumption	9mW(2)	20mW	90mW (3,5)
Power consumption (off - standby)	-	85µW	-
Digital input threshold for logic '1'	-	>2V	-
Digital input threshold for logic '0'	-	<0.6V	-
Weight (boxed unit, with battery fitted)	-	150g	-
RS232 baud rate	113	115,200	921600
Maximum guaranteed sustained full rate data logging speed	-	460,800 (4,5)	921,600 (3,5)
RS232 switching input threshold - Low	0.6V	1.2V	-
RS232 switching input threshold - High	-	1.5V	2.4V
Size (boxed unit, W x L x D)	-	65 x 93 x 31mm	-
Media life expectancy (FLASH media card specific, card supplied)	-	1,000,000 write operations	-
Number of changes to system settings.	500,000	-	-

1. Test conditions: Continuous data logging of a single channel of GPS NMEA data at 4800 baud using a Duracell Plus PP3 cell and 4GByte Sandisk Extreme III SDHC flash media.
2. Test conditions: Record mode, dual channel 4800 baud, no Tx connections, LEDs disabled, waiting for more data.
3. Test conditions: Continuous data logging of replayed test data at full data rate 921,600 baud, single channel, using a Duracell Plus PP3 cell, 4GByte SDHC flash media option.
4. Test conditions: Continuous data logging of replayed test data on two channels simultaneously, each at full data rate 460,800 baud, using Duracell Plus PP3 cell, 4GByte SDHC flash media option and a 1.8m RS232 connecting cable.
5. Maximum recording rate and unit power consumption is ultimately limited by performance of FLASH media card in use.
6. Environmentally tested extended temperature range versions available upon request.